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A Comparison of Methamphetamine Users to a Matched NHANES Cohort: Propensity Score Analyses for Oral Health Care and Dental Service Need

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Abstract

Dental problems are among the most frequently reported health issues of drug users. This study describes, among the largest population of methamphetamine (MA) users to date ($N = 459$, including both HIV-negative and HIV-positive participants): oral hygiene practice, dental care access, and dental quality of life. A matched control group from the Third National Health and Nutrition Examination Survey was utilized. Findings conclusively establish that MA users have severe oral health deficits compared to the general population: they are 3.5 times more likely to experience painful toothaches, 6.6 times to experience difficulty eating, and 8.6 times to be self-conscious due to dental appearance. HIV-positive users were more likely to have regular dental visits than HIV-negative users. Severity of use (both high frequency use as well as injection as the method) was associated with poorer oral health care. Despite the magnitude of the need, few MA users receive the needed care.

Keywords

Oral Health; Dental Health Surveys; Drug Users; Methamphetamine; HIV

Introduction

Oral health is an integral part of general health. Poor oral health has been linked to mortality, coronary heart disease, morbidity, poor nutrition, speech impediments, reduced

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Conflict of Interest Authors report no conflict of interest with the reported study.

employability, and poor self-image.[1,2] In addition, oral disease may exacerbate systemic conditions such as vascular disease, respiratory disease, and diabetes.[3] Vulnerable populations, particularly racial/ethnic minorities with low socioeconomic status (SES) and the homeless, are more likely to have poor oral health compared to the general population.[4–6] Similarly, drug abusers can also have increased susceptibility to oral and dental disease. This is due to interactions between their patterns of substance use, personal incapacities, and inadequacies of resources and support systems.

Drug abuse and dental problems

Dental problems are among the most frequently reported health problems among drug abusers, and drug use has been independently associated with the need for dental care.[7] Drug, alcohol, and tobacco users have a higher incidence of oral conditions including oral candidiasis, periodontal problems, stomatitis and precancerous lesions.[8] In a study comparing “alcohol abusers only” to “alcohol and drug abusers,” Dasanayake et al.[9] found that the alcohol and drug group had a 38% higher risk of having decayed teeth compared to the alcohol only group. Even among drug abusers with satisfactory oral hygiene, drug use has been associated with greater dental decay.[10]

While the effects of tobacco smoking and alcohol use on oral health have been broadly studied, the oral health of users of illicit drugs has received less attention.[11] High caries experience has been seen in heroin users.[12,13] In addition, higher levels of dental decay have been found among individuals who inject drugs than similarly aged national cohorts, non-drug using groups, and ex-drug using groups.[10,14] Despite the relative lack of oral health research in drug abusing populations, it is likely that the drug side effects as well as the chaotic life-styles of the users can adversely impact their oral and dental health. All of the following are likely to increase the propensity for dental disease: the xerostomic effects of many drugs; poor nutrition and irregular eating patterns; and the blunting of pain precipitated by dental disease.

Of the illicit drugs, Methamphetamine (MA) use has drawn particular interest due to its widespread use and reported association with significant dental decay. The widespread reports of dental disease in MA users led the American Dental Association[15] to identify oral health problems associated with MA as a serious dental health problem. Postulated mechanisms of MA-associated dental disease include: (1) xerostomia, or dry mouth, produced by a central inhibition of salivatory nuclei via stimulation of alpha-2 receptors in the brain; (2) a general state of dehydration state that leads to a high frequency consumption of carbonated soft drinks; and (3) little or no attention to oral hygiene.[16,17] Oral disease was a prominent finding among MA users (N = 301) who were otherwise healthy (41.3%).[18] MA users had significantly more missing teeth than did matched National Health and Nutrition Examination Survey (NHANES III) participants. Despite a mean age of only 36.5 years, 60% of MA users had a mean of 4.58 missing teeth (excluding third molars). Moreover, 13.3% of the MA group was already wearing dentures (partial or complete). In addition, IV use of MA was significantly more likely to be associated with missing teeth than was smoking MA (OR = 2.47, C.I. = 95%). Similarly, Ravenel et al.[19] found significantly higher rates of decayed surfaces and missing teeth among a sample of 28 MA users compared to 16

control subjects. In a sample of 18 MA users and age and sex-match controls, Morio et al.[20] found that MA users were more likely to never brush their teeth.

HIV-infection and dental problems

For MA users patients whose immune system is compromised by HIV infection, the negative synergy with MA consequences can only aggravate the oral health effects of HIV. Oral problems are a frequent and early finding in HIV infection.[21,22] A weakened immune system puts HIV positive patients at greater risk for periodontal disease, and opportunistic lesions such as candidiasis and hairy leukoplakia. In addition, salivary gland function is adversely affected early in HIV infection. The decreased salivary flow rate increases the risk of dental caries and negatively impacts the patient's quality of life. This is due to the increased difficulty in chewing, swallowing and tasting food. Although Highly Active Anti-Retroviral Therapy (HAART) appears to have minimized the spectrum of HIV-related oral lesions, there is a shift of prevalence towards periodontal diseases.[23]

Summary and purpose of the present study

While we are beginning to learn more about the dental and oral impact of MA use, very little is known about the other interrelated dimensions including oral health care patterns of MA users, the availability or lack of care, the regularity of their dental visits, and the quality of life issues among this group. In addition, the majority of the studies conducted have included very small sample sizes of MA users, limiting the ability to investigate differences related to amount of MA use and method of use (e.g., smoking vs. injection). The paucity of information is particularly severe in the case of HIV-infected individuals, who comprise a significant subset of MA users.

The purpose of this study was to describe among the largest population of MA users to date (N = 459): oral hygiene practice; dental care access/regularity; and self-report of dental problems focusing on quality of life issues. A matched group of nonusers from participants in the Third National Health and Nutrition Examination Survey (NHANES III) was utilized as a control sample. In addition, within the MA sample we investigated differences between HIV-negative and HIV-positive participants to determine whether hygiene practices, dental care access, or report of dental problems differed between these groups. We hypothesized that HIV-positive MA users would be more likely to access dental care regularly, since they are more likely tied into treatment systems through their HIV-related health care.

Methods

Setting and participants

A total of 459 MA-using individuals were recruited from the Los Angeles area between assessed at two large community dental clinics. The first community site was Mission Community Hospital-UCLA Dental Center (MCH). MCH is located in the San Fernando Valley within the Los Angeles metropolitan area. It is a public clinic that provides general dentistry on a sliding scale based on patient income. The second site was AIDS Project Los Angeles (APLA) Dental Services, Inc. APLA provides comprehensive dental services to people living with HIV/AIDS throughout L.A. County. The original clinic opened in 1985 as

the nation's first dental facility dedicated to serving persons living with HIV/AIDS. HIV-negative methamphetamine users were also seen for assessments at this site.

Subjects were considered eligible if they were age 18 or older, had used MA in the past 30 days, spoke either English or Spanish, able to complete detailed dental exam and psychosocial assessments, and provide a urine sample. Written consent from eligible subjects was obtained by trained research staff using procedures approved by the Institutional Review Board at the University of California, Los Angeles, and the study was reviewed and approved by the IRB at the University of California, Los Angeles. In addition, a Certificate of Confidentiality was obtained from the National Institute of Health (NIH) for this research. Certificates of Confidentiality are issued by the NIH to protect identifiable research information from forced disclosure. They allow the investigator and others who have access to research records to refuse to disclose identifying information on research participants in any civil, criminal, administrative, legislative, or other proceeding, whether at the federal, state, or local level.

Procedures

Potential participants were recruited through: (1) referrals from local treatment sources (e.g., drug treatment centers); and (2) passive recruitment strategies (e.g., posting flyers within the community, distributing advertising matchboxes in bars and restaurants, and announcements in local newspapers and Craigslist). Interested individuals were screened by phone or in person at one of the two study sites (a HIV primary care clinic and a Community Clinic; see descriptions of sites, above), and eligible subjects were consented for the study using IRB approved procedures.

Participants were scheduled and their appointment at the dental clinic was for “The Dental Health Study.” Thus, they were not identified in any way as HIV-positive or as an MA user when waiting in clinic waiting rooms for their appointment. Depending on the subject's preference, a trained bilingual interviewer conducted an extensive, computer-facilitated, psychosocial interview in either English or Spanish. Trained calibrated dental examiners then conducted a detailed dental exam. (The analyses for this paper used only data derived from the psychosocial assessment.) On completion of the assessments, subjects were paid for participation, but not in cash. Rather, they were provided $60 in gift cards for a local grocery store or discount retailer (Target or Ralphs gift cards).

Measures

Sociodemographics—Selected questions from the National Health and Nutrition Examination Survey (NHANES)[24] were utilized to obtain subjects' age, gender, race, ethnicity, level of education, country of origin, and marital status. The NHANES is a compilation of studies that examines the general health and nutritional status of adults and children in the United States. It uses a nationally representative sample of approximately 5,000 people per year.

Level of MA use—Subjects were asked the number of days in the past month they had used MA. Those who replied 1 - 9 days were categorized as low users, 10 - 15 as moderate,

and 16 days or more days as high users.[16,25–28] In addition, for lifetime use, questions from the Natural History Interview (NHI)[29] were administered. The NHI obtains detailed information on lifetime use, including: age at first used, age of beginning of regular use, most recent period of voluntary abstinence, and the number of days since they have used MA. In addition, for each year they used MA, data was collected on average frequency of use, the method (inhaled, smoked, injected, oral, or other), and the amount of months within each year of use.

Access to dental care and self-report of dental problems—To evaluate subjects' access to dental care, NHANES questions were administered to determine whether subjects visited the dentist regularly for check-ups, and if so, the duration of time since the subjects' last visit to the dentist. Subjects were queried whether they had a dental extraction in the past year. In addition, subjects rated whether their mouths felt dry during meals, and if they considered their saliva production to be insufficient (xerostomia), excessive, or not noticeable (on a scale of 1 to 5, with 1 being excellent and 5 being poor). Subjects were also asked questions from the NHANES that derive from the Short-Form Oral Health Impact Profile (OHIP-14).[30] The questions assessed the subjects' perceptions of how their dental health impacted their quality of life (e.g., “How often during the last year have you felt that life in general was less satisfying because of problems with your teeth, mouth or dentures?”). To replicate oral health questions asked within the NHANES surveys, the MA using subjects sample were asked about the frequency of experiencing the following events due to dentures, mouth, or teeth: feeling that life in general was less satisfying, finding it uncomfortable to eat any food, feeling self-conscious or embarrassed, having difficulty doing usual jobs or going to school, having sense of taste affected, avoiding particular foods, or having painful aching anywhere in the mouth. (Answers were on a 5 point scale from “very to “never.”)

HIV status—Subjects were asked if they had ever had an HIV test, and if so, whether they were HIV-positive. Subjects with affirmative responses were questioned regarding their CD4 count, viral load, and the month and year they first tested positive for HIV.

Statistical methods

Propensity score matched cohort—Propensity-score methodology is a statistical technique used in observational studies to reduce bias from confounding variables when treatment assignment is not random. For the purposes of this study, this procedure was used to identify subjects from NHANES that would most closely resemble the MA sample based on available demographic variables. These selected subjects from NHANES can then serve as a control sample for comparison. Individual propensity scores were estimated through logistic regression on variables including: (1) age; (2) gender; (3) whether subject was Hispanic and born in the U.S. or born in Mexico; (4) whether as subject was non-Hispanic African-American/black; (5) whether a subject was non-Hispanic white; (6) whether a subject was born in a country different than the U.S. or Mexico; (7) whether the subject obtained a high school diploma or General Equivalence Diploma (the equivalent of a high-school diploma); (8)whether the subject was a current, former, or never smoker; and (9) whether or not the subject was married or living with a partner. Subjects were included for

analysis if their estimated propensity score fell between the second-lowest and second-highest propensity scores from the MA sample. Thus, 459 subjects (MA sample) and 1,306 subjects (NHANES 2003 - 2004 sample) were included. Propensity scores were grouped by splitting the entire sample of 1,765 into quantiles, starting at 2, until regression analysis on all demographic variables showed approximately equal distributions of the demographic variables between the MA and NHANES samples after adjusting for propensity score group. This procedure resulted in 5 propensity score groups with 352 - 354 subjects each, where the covariates were balanced between MA and NHANES within each of the groups. The demographic characteristics of each propensity score group are reported in Table 1.

Data analysis—In addition to descriptive statistics, separate logistic regressions for each outcome related to the OHIP-14 survey (indicating “very often” or “fairly often” as opposed to “occasionally,” “hardly,” or “never”) were performed within each propensity score group with an indicator as coming from the MA sample as the only predictor. Overall odds ratio and confidence intervals across groups were estimated by a weighted average proportional to the percent of the MA sample included in each propensity score group. Because the log odds ratio is assumed to follow a normal distribution, the weights were applied to the log odds ratio to generate an estimate and confidence interval for the weighted log odds ratio. This value and CI were then exponentiated to yield an estimate and 95% CI for the overall odds ratio. If there were no subjects who experienced the outcome in either the MA portion or the NHANES portion of the propensity score group, then the propensity score group was merged with the next lowest group according to propensity scores. All analysis was conducted using SAS version 9.2.

Results

Sample characteristics

Subjects were overwhelmingly male (n = 377, 82.2%), and 27.5% of the subjects reported they were HIV-positive (Table 2). On average, the participants reported MA use on 9.4 (SD = 7.3) days over the last 30 days. Thirty-nine subjects (8.9%) specified IV injection as their most common method of MA use across all years of use reported, while 68 (15.1%) indicated IV injection as their most frequent drug delivery method in at least one calendar year.

Methamphetamine/NHANES comparison

Table 3 shows the frequency of each reported outcome between the MA and NHANES samples and the overall weighed odds ratio and confidence interval across propensity score groups for subjects reporting “fairly often” or “very often” to the life satisfaction question. There were no significant differences in the probability of visiting a dentist in the last two years within any of the propensity score groups (OR = 0.89, 95% CI: 0.31, 2.54). The overall odds ratios indicated significant differences between the MA and NHANES subjects on all other questions. Compared to subjects from the NHANES sample, MA users were 4.4 times more likely to report having too little saliva (95% CI: 2.32,8.39, $p < 0.0001$), 7.2 times more likely to frequently experience dry mouth when eating (95% CI: 3.84,13.58 $p < 0.0001$), and three times more likely to often have altered taste (95% CI: 1.46, 6.22; p =

0.0027). Regarding problems due to their teeth, mouth, or dentures, MA users were: 4.5 times more likely to often feel embarrassed or self-conscious; 2.5 times more likely to indicate that life was frequently less satisfying; and were 9.4 times more likely to state frequent difficulty performing jobs or going to school. Subjects from the MA cohort experienced recurrent painful aching in their teeth and mouth at a rate 3.5 times greater than the NHANES subjects. MA subjects were 5.0 times more likely to avoid certain foods on a regular basis due to oral problems and were 6.0 times as likely to experience difficulty eating.

Comparison between low, medium, and high MA use

MA users in this study were grouped according to the number of days of MA use over the 30 days prior to the interview (low = 1 - 9 days of use, medium = 10 - 15, and high = 16 – 30). There was a significant difference in the frequency of responding “often” or “very often” to experiencing painful aching in teeth or mouth ($p = 0.026$), with 28.9% of high frequency users reporting “often” or “very often,” compared with 18.6% of medium users and 16.1% of low users. High users indicated having a painful tooth or toothache within the last 30 days at a higher frequency (45.4%) than medium (43.4%) or low users (32.5%, $p = 0.034$). High users were less likely (10.3%) to indicate that they “go to a dentist regularly to get (their) teeth checked” compared with low (22.5%) and medium (23.0%, $p = 0.026$). Low users were more likely to report ($p = 0.055$) the need to use liquids (63.9%) when eating dry foods than medium users (54.0%) and high users (51.6%). There was no significant difference between the groups on the other dental behaviors or outcomes.

Difference between IV MA users and other users

MA users who reported IV use as their most frequent drug delivery method across all years of MA use (denoted as long term IV users) were twice as likely to report having a tooth pulled in the last year (OR = 2.14, 95% CI: 1.06,4.30; $p = 0.0295$). Subjects who reported IV as their most common form of MA use for at least one calendar year were significantly less likely to brush their teeth between one and three times daily than MA users who did not use IV injection on a regular basis (OR = 4.76,95% CI: 0.24,0.93; $p = 0.027$). Those subjects were more likely to report pain or aching in their teeth within the last 30 days (OR = 1.71, 95% CI: 1.01, 2.87; $p = 0.043$). Long-term IV users were also significantly more likely to indicate frequent difficulty performing jobs or attending school due to oral health problems (OR = 2.843, 95% CI: 1.039, 7.778; $p = 0.042$), but this association was not present across all MA users with at least one year of frequent IV use ($p = 0.2$). Also, long-term IV users reported a greater probability of feeling embarrassed or self-conscious because of their teeth (OR = 2.14, 95% CI: 1.10, 4.15; $p = 0.022$).

The years in which a subject reported IV injection as the most frequent form of MA delivery was recorded. The proportion of adult years in which IV was the main form of MA delivery was calculated by dividing this number by age minus 18 (note: some users began using earlier than the age of 18, so values greater than 1 were truncated to equal 1). The percentage of adult years in which IV injection was the predominant form of MA delivery proved to be a significant predictor for one outcome: being more likely to respond “often” or “very often” to feeling embarrassed by teeth (OR = 3.42, 95% CI: 1.024, 11.39; $p = 0.046$).

Difference between HIV negative and positive MA users

Table 4 summarizes the differences between HIV-positive and negative subjects on how often the subject reported visiting the dentist and whether or not the subject visited a dentist regularly. HIV-positive subjects were 2.9 times more likely to report that they had visited a dentist once a year or more (95% CI: 1.89, 4.40; $p < 0.0001$), and 3.2 times more likely to indicate visiting a dentist "regularly" (95% CI: 1.98, 5.13; $p < 0.0001$), compared to the HIV-negative MA users. Also, HIV-positive MA users were 85% more likely to report having too little saliva than HIV-negative MA users (OR=1.85, 95% CI: 1.16, 2.94; $p = 0.009$) and were 2.4 times more likely to have visited a dentist in the last two years (95% CI: 1.58, 3.72; $p < 0.0001$).

Discussion

This study, the largest systematic study of the oral health and practices of MA users, conclusively establishes that MA users have severe oral health deficits compared to similar individuals from the general population. In our study, MA users expressed basic functioning deficits. They were 3.5 times more likely to experience recurrent painful toothaches compared to the general population, 4.4 times more likely to experience dry mouth, and 6.6 times more likely to experience difficulty eating. In addition, MA users reported more self-image problems related to their dental issues, being 8.6 times more likely to report being embarrassed or self-conscious.

The fact that MA users experience such basic difficulties underscores the large oral health disparities. It also emphasizes the critical need to intervene with this population. Particularly striking was our finding that MA users were 9.4 times more likely, compared to individuals from the general population, to have difficulty performing a job or attending school due to their oral health problems. They were also likely to experience pain regularly. Given that our subjects were mostly younger and in the prime of their life (in terms of typical contribution to the job market), the lost productivity due to severe oral health problems has large societal and public health implications. Our findings confirm and extend previous work by Morio et al.,[20] who reported that MA users had poorer general hygiene, and of Ravenel et al.,[19] who found higher rates of missing teeth among a small sample of MA users compared to control subjects.

Severity of MA use can be viewed in two ways: frequency of use (i.e., low, medium, or high use); or method of administration, with IV use of MA considered more severe than other methods of administration. IV users reported the most severe problems (more teeth pulled, less dental hygiene, more pain/aching). Given these findings, it is not surprising that these individuals also had more challenges in terms of work performance or school attendance. This sub-population of MA users seems to be the highest priority to target for services. Our findings reflect the earlier findings of Shetty et al.,[18] who found IV use in MA users was significantly more likely to be associated with missing teeth than was smoking MA (odds ratio = 2.47; 95 percent). Similarly, medium and high MA users were less likely to engage in oral hygiene than were low use individuals. Thus, severity of use in terms of both definitions appears to be a factor driving oral health care.

All of these findings--particularly that severity of MA use appears to be a main factor in dental disease--argue for early recognition and treatment of MA users. It could be especially beneficial to target them for treatment when they are in the more amenable low-use phase, in order to minimize or prevent more severe oral health problems. Early treatment would be more cost effective for two reasons. The first is as stated, that public health costs related to more severe oral health problems will be prevented. In addition, the treatment needed early is likely to be less resource extensive. For example, Shoptaw and Reback[31] have suggested that individuals who use MA infrequently may respond to lower intensity/lower cost early intervention programs, while those using the drug at dependence levels may need higher intensity treatment.

There were few findings distinguishing HIV+ MA users from HIV- users. As hypothesized, HIV-positive MA users were more likely to have regular dental visits than HIV-negative MA users. This was not due to differences in MA use. HIV-positive individuals are most likely more tied into the health care system and therefore, more likely to obtain referrals across a spectrum of health-related issues, including dental problems. In addition, in Los Angeles County levels of HIV discrimination are lower in dental care than other health care services in the county, over 90% in one study accept and treat people living with HIV/AIDS.[32] Such dental health service care may mitigate some of the added problems HIV-infected MA users would be expected to have, as there were few oral health differences between the HIV-negative and HIV-positive MA users. For example, it would be expected that HIV-positive MA users may experience even more xerostomia than HIV-negative users. While all MA users reported more xerostomia than the NHANES general population, especially when eating, there was not a significant difference between the HIV-positive and HIV-negative MA users. The only difference between the HIV-positive and HIV-negative users was that the HIV-infected group was more likely to get their teeth checked regularly and to have had a tooth pulled in the past year. There were no differences on their report of oral health care practices, the general condition of their teeth and gums, nor recent experiencing of toothache or pain with biting, chewing, or hot or cold foods.

Our study has some limitations. First, many of the subjects were from a convenience sample of HIV-positive patients recruited from a HIV primary care clinic. The enrollment may have been vulnerable to selection bias because the enrolled subjects responded voluntarily or were referred by friends participating in the study. Also, it is likely that the recruits were significantly different from MA-users who did not respond to recruitment efforts. However, our findings derive from, to date, the largest systematic study of oral health in MA users.

Propensity-score methodology for the selection of a comparison sample assumes that there are no other factors outside of the included covariates that could pertain to the probability of being in the MA versus NHANES sample. There are also limitations involving choice of a comparison cohort from the NHANES study. The NHANES subjects included were enrolled in 2003-2004, whereas information on the MA users was collected from 2011 to 2013. The NHANES subjects were recruited from the entire US population, while the MA users were only from the Los Angeles metropolitan area. While the propensity-score model controlled for many of the potential differences in subjects using the available variables, it is possible

that there are other factors related to both MA use and the outcomes that could not be addressed in this study.

Implications for Behavioral Health

In conclusion, our study substantiates the finding of disproportional dental disease in MA users. Despite the magnitude of the need, few MA users receive the needed care. Interestingly, the availability and accessibility of dental services specifically designated for low-income HIV-positive individuals (e.g., Ryan White HIV/AIDS Program) renders them less likely to have unmet dental care needs than HIV-negative MA using individuals. The identification of oral health-care needs for MA users is an important first step towards a differentiated approach to the overall management of MA addictions and should help inform future interventions as well as health resource allocations.

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Table 1

Distribution of Demographic Characteristics within Propensity Score Groups

	Group 1	Group 2	Group 3	Group 4	Group 5
NHANES *n*	347	340	310	198	111
MA *n*	6	13	43	156	241
Gender					
Male	166 (47.0%)	172 (48.7%)	178 (50.4%)	268 (75.7%)	326 (92.6%)
Female	187 (53.0%)	181 (51.3%)	175 (49.6%)	86 (24.3%)	26 (7.4%)
Marital Status					
Single	108 (30.6%)	120 (34.0%)	255 (72.2%)	348 (98.3%	352 (100%)
Married/Living as Married	245 (69.4%)	233 (66.0%	98 (27.8%)	6 (1.7%)	0 (0%)
Education					
Did not graduate high school	100 (28.3%)	129 (36.5%)	75 (21.2%)	151 (42.7%)	83 (23.6%)
Graduated high school/GED	253 (71.7%)	224 (63.5%)	278 (78.8%)	203 (57.3%)	269 (76.4%)
Ethnicity					
Caucasian (Non-Hispanic) White	148 (41.9%)	153 (43.3%)	160 (45.3%)	134 (37.9%)	35 (9.9%)
African American/Black	94 (26.6%)	80 (22.7%)	113 (32.0%)	100 (28.3%)	165 (46.9%)
Hispanic	109 (30.9%)	118 (33.4%)	72 (20.4%)	102 (28.8%)	121 (34.4%)
Other	2 (0.6%)	2 (0.6%)	8 (2.3%)	18 (5.1%)	31 (8.8%)
Smoking Status					
Current	48 (13.6%)	170 (48.2%)	163 (46.2%)	207 (58.5%)	270 (76.7%)
Former	84 (23.8%)	50 (14.2%)	67 (19.0%)	43 (12.2%)	21 (6.0%)

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Table 2

Demographic Characteristics and MA Use Patterns of the MA Sample (*n* = 459)

	Full Sample		HIV -		HIV+	
Characteristic	***N***	**%**	***N***	**%**	***N***	**%**
Sex						
Male	377	82.14%	257	77.18%	120	95.24%
Female	82	17.86%	76	22.82%	6	4.76%
HIV Status						
Positive	126	27.45%	0	0%	126	100%
Negative	333	72.55%	333	100%	0	0%
Marital Status						
Married/Living as Married	27	5.88%	23	6.91%	4	3.17%
Widowed, Divorced, or Separated	98	21.35%	82	24.62%	16	12.70%
Never Married	334	72.77%	228	68.47%	106	84.13%
Race or Ethnicity						
White	102	22.22%	82	24.62%	20	15.87%
African-American	182	39.65%	137	41.14%	45	27.45%
Asian	2	0.44%	1	0.30%	1	0.79%
Hispanic	143	31.15%	96	28.83%	47	37.30%
Other	30	6.53%	17	5.12%	30	10.40%
Education						
Did not graduate high school	129	28.10%	93	27.93%	36	28.57%
High school graduate/GED	157	34.20%	110	33.04%	47	37.30%
Some college (no degree)	121	26.36%	93	27.93%	28	22.22%
Associate degree	16	3.49%	12	3.60%	4	3.17%
Bachelor's degree	31	6.75%	21	6.31%	10	7.94%
Master's degree	5	1.09%	4	1.20%	1	0.79%
Most frequent form of MA						
Consumption (missing = 20)						
IV Injection	39	8.88%	24	7.52%	15	12.5%
Other	400	91.12%	295	92.48%	105	87.50%

	Full Sample		HIV -		HIV+	
Characteristic	***N***	**%**	***N***	**%**	***N***	**%**
MA Use Category						
Low (1-9 days)	249	54.25%	184	55.26%	65	51.59%
Medium (10-15 days)	113	24.62%	72	21.62%	41	32.54%
High (15-30 days)	97	21.13%	77	23.12%	20	15.87%
	M (SD)	Min, Max	*M (SD)*	Min, Max	*M (SD)*	Min, Max
Age	44.13 (9.43)	19, 70	43.75 (10.11)	19, 70	45.63 (7.43)	26, 57
Number of days using MA in the previous 30 days	9.4 (7.33)	1, 30				
Proportion of adult years in which IV injection was the most frequent form of MA use ($n = 443$)	0.052 (0.16)	0,1	0.052 (0.17)	0, 1	0.046 (0.12)	0, 0.62

Table 3

Frequency of Reported Outcomes Between the NHANES and MA Samples

		Very Often	Fairly Often	Occasionally	Hardly	Never	Weighted Odds-Ratio[a]
How often during the last year have you felt that life in general was less satisfying because of problems with your teeth, mouth or dentures?	NHANES	50 (3.8%)	38 (2.9%)	97 (7.4%)	138 (10.6%)	982 (75.3%)	3.12‡ (1.77,5.49)
	MA	56 (12.2%)	56 (12.2%)	87 (19.0%)	101 (22.0%)	159 (34.64%)	
How often during the last year have any food because of problems with your teeth, mouth or dentures?	NHANES	64 (4.9%)	41 (3.1%)	154 (11.8%)	123 (9.4%)	923 (70.7%)	6.03‡ (3.42,10.64)
	MA	90 (19.6%)	75 (16.3%)	134 (29.2%)	54 (11.7%)	106 (23.1%)	
How often during the last year have you been self-conscious or embarrassed because of your teeth, mouth or dentures?	NHANES	88 (6.7%)	45 (3.5%)	106 (8.1%)	83 (6.4%)	983 (75.3%)	4.46‡ (2.74,7.26)
	MA	118 (25.8%)	65 (14.2%)	96 (21.0%)	56 (12.3%)	122 (26.7%)	
How often during the past year have you had difficulty doing your usual jobs or going to school because of problems with your teeth, mouth or dentures?	NHANES	12 (0.9%)	14 (1.1%)	37 (2.8%)	79 (6.1%)	1161 (89.1%)	9.41** (2.23,39.65)
	MA	29 (6.3%)	27 (5.9%)	80 (17.4%)	103 (22.4%)	220 (47.9%)	
How often during the last year has your sense of taste been affected by problems with your teeth, mouth or dentures?	NHANES	26 (2.0%)	22 (1.7%)	51 (3.9%)	65 (5.0%)	1138 (87.4%)	3.02** (1.47,6.22)
	MA	34 (7.4%)	31 (6.8%)	86 (18.7%)	75 (16.3%)	233 (50.76%)	
How often during the last year have you avoided particular foods because of problems with your teeth, mouth or dentures?	NHANES	66 (5.1%)	48 (3.7%)	145 (11.1%)	98 (7.5%)	947 (72.6%)	5.00‡ (2.75,9.10)
	MA	75 (16.3%)	61 (13.3%)	128 (27.9%)	42 (9.2%)	153 (33.3%)	
How often during the last year have you had painful aching anywhere in your mouth?	NHANES	46 (3.5%)	61 (4.7%)	180 (13.8%)	254 (19.5%)	764 (58.5%)	3.48† (1.69,7.16)
	MA	35 (7.6%)	54 (11.8%)	177 (38.7%)	118 (25.8%)	74 (16.2%)	

[a] Weighted Odds-ratio of Fairly or Very Often to Occasionally, Hardly, or Never

* $p < 0.05$.

** $p < 0.01$.

† $p < 0.001$.

‡ $p < 0.0001$.

Table 4
Dental Outcomes Within MA sample by HIV Status

	HIV-	HIV+	P-value for Chi-square or Fisher exact test
Do you go regularly to get your teeth checked?			<0.0001
No	285 (85.6%)	82 (65.1%)	
Yes	48 (14.4%)	44 (34.9%)	
How often do you get your teeth checked?			<0.0001
More than once a year	27 (8.1%)	33 (26.2%)	
Once a year	76 (22.8%)	38 (30.2%)	
Once every two years	61 (18.3%)	20 (15.9%)	
Less than once every two years	169 (50.8%)	35 (27.8%)	
How often do you usually brush your teeth?			0.32
Don't Brush	13 (3.9%)	3 (2.4%)	
Less than once a day	28 (8.4%)	12 (9.5%)	
Between once and 3 times a day	285 (85.6%)	111 (88.1%)	
Other	7 (2.1%)	0 (0%)	
Have you had a tooth or teeth pulled in the past year?			0.0072
No	269 (80.8%)	87 (69.05%)	
Yes	64 (19.2%)	39 (30.95%)	
General condition of teeth and gums			0.70
Excellent	8 (1.2%)	2 (1.6%)	
Very good	9 (2.7%)	4 (3.2%)	
Good	67 (20.2%)	22 (17.5%)	
Fair	102 (30.7%)	47 (37.3%)	
Poor	150 (45.2%)	51 (40.5%)	
During the past 30 days have you experienced a toothache or painful tooth (including pain with biting or chewing, or sensations to hot, cold, or sweets)?			0.55
No	204 (61.3%)	81 (64.3%)	
Yes	129 (38.7%)	45 (35.7%)	
Do you need to sip liquids to aid in swallowing dry foods?			0.30
No	142 (42.6%)	47 (37.3%)	
Yes	191 (57.4%)	79 (62.7%)	