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Self-Reported Health Status Among Treated Methamphetamine Users

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ABSTRACT

Very little research has examined how drug abuse is related to general health status over the long term among both young and middle-aged adults. In this article, we investigate how self-reported health status is related to prolonged methamphetamine (MA) use in a diverse sample of MA users from ages 18 to 52 who have been treated for drug abuse in Los Angeles County. Using retrospective data, we investigate how prolonged MA use within younger and older age groups is related to two self-reported measures of current health status: the presence of a health condition that began after starting illegal drug use, and overall health. We control for the effects of drug use history, social and demographic factors, and other early experiences (e.g., early sexual abuse) that might be

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obstacles to achieving good health later in life. We find that having a current health condition is predicted by greater age and by more prolonged MA use, especially among younger people. Early sexual abuse predicts both measures of poor health. Current health status is predicted by several measures of drug use history and early experiences, but by fewer social and demographic factors. The results suggest that reduction of MA use among younger people is important in promoting their later health and that MA treatment services could be improved by a greater understanding of how early experiences influence later health.

Key Words: Methamphetamine; Self-reported health; Age and health.

In this article, we describe self-reported health status and investigate its relationship to prolonged methamphetamine (MA) use in a diverse sample of MA users who have been treated for drug abuse in Los Angeles County. Many short-term or specific health consequences have been reported among MA users (1–3). Very little research, however, focuses on how general physical health might be influenced by MA use over the long term. Health problems magnify other long-term social costs of MA use, such as reduced work effort, disruptions in family relations, and poorer mental health (4,5). Moreover, compared with the use of other drugs, MA use may have a disproportionate influence on public health, particularly through its association with risky sexual behaviors that have been linked to the spread of sexually transmitted diseases, including hepatitis and HIV (5–8).

Although adverse health effects of illegal drug use have been documented among relatively young adults (9,10), research is lacking on the health consequences of MA use for older people, among whom MA use has often been more prolonged than among young people. Many health conditions begin to appear in middle age, particularly among socioeconomically disadvantaged individuals (11), who are likely to be overrepresented among MA users (12). Our sample has the advantage of including MA users from ages 18 to 52 who differ widely in frequency, duration, and history of MA use and non-use since age 14.

Our aim is to examine the effects of prolonged MA use on current health status among a group of people who share a history of MA use and of treatment, and who therefore also may share many characteristics associated with these experiences. Treatment services can be delivered more effectively if a better understanding of the potential health effects of MA among MA users is achieved. This may be especially important in California, where MA

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is one of the major drugs of abuse and MA-related admissions to drug treatment programs and to emergency rooms recently increased rapidly (12).

BACKGROUND AND HYPOTHESES

All drug use, including MA use, is embedded in a sociocultural environment that has determinative properties. Social environments may differ between drug users and non-users in ways that both directly affect health and also may influence the prevalence of health-related behaviors, particularly over long periods of time (11,13). We therefore developed an analytic model that includes the following: 1) measures of drug use behaviors from a respondent's self-reported drug use history; 2) measures of social positions that might be related to health status using commonly researched social and demographic variables; and 3) measures of other early factors, such as early sexual abuse and severe mental illness, which may both create obstacles to achieving good health and be endemic among substance users.

**Health Effects of Methamphetamine Use
and Substance Use History**

Methamphetamine use clearly has short-term effects on health that are consistent with its effects as a stimulant, including increases in heart rate, blood pressure, temperature, and rate of breathing; constriction of blood vessels; and cardiac arrhythmia (2,3). Moreover, MA use over longer periods of time is related to specific health conditions including stroke, cardiac valve thickening, decreases in lung function, pulmonary hypertension, changes to the brain, poorer cognitive functioning, and poorer mental health (1,2,12,14,15). However, findings are mixed on how general health is related to MA use compared with other drug use. Some findings suggest that MA users are no more likely than other drug users to report poor health (12). Other findings suggest that, compared with the use of other drugs, MA use is related to greater health risks and conditions such as polydrug use (7,8,16), riskier sexual behavior, and higher rates of sexually transmitted diseases (STDs) (5–8,17).

A primary reason for conducting this research is to assess whether the relationship between MA use and health becomes clearer in the long term. In fact, one of the few longitudinal studies of health in relation to prolonged drug use—in that case, cocaine use—found that frequency and duration of use were negatively related to health among men in a general population sample (9). Considering these findings, we hypothesize that poorer health status will be



predicted by greater frequency and duration of MA use, compared with lesser frequency and duration of use. As discussed below, we examine the relationship of MA use to health status within age categories.

Injection Drug Use

Findings about the relative health status of injection drug users (IDUs) and non-IDUs among MA users are mixed. In one study, although MA IDUs had higher rates of HIV infection than did other MA users, the IDUs were not significantly different from the non-IDUs in the incidence of chest pains, headaches, seizures, or health care utilization (20). In other studies, however, MA IDUs tend to report more medical problems than do other MA users (4,18). It may be that, like other IDUs, MA IDUs are particularly at risk for a small subset of serious health conditions, such as hepatitis and HIV infection (12,19), compared with other MA users, but are not likely to differ on other specific symptoms. We therefore hypothesize that on our general health measures, MA IDUs will be more likely to report poor health status than other MA users.

Age at First Regular Drug Use

In a sample of adult arrestees, MA users initiated substance use at earlier ages than those who did not use MA (4). This is noteworthy because, in that sample and in other studies, earlier onset of drug use was related to later drug use in adulthood and to polydrug use (4). Therefore, earlier regular drug use may predict more prolonged MA use and may confound the relationship of MA use to health status. We hypothesize that earlier age at first regular substance use will predict poorer health status.

Relationship of Social and Demographic Factors to the Health Effects of Methamphetamine Use

Age

Age is an essential factor to consider in an analysis of health status because in the general population, health typically is poorer among those who are older [e.g., See Refs. (11,21)]. Nonetheless, among drug users there sometimes appears to be little relationship between health status and age in analyses covering short periods of time (22,23). We believe that this



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relationship will emerge with more long-term data and a wider age range. We expect to find longer durations of MA use among older users because most drug abuse begins when people are less than 30 years old (24). However, MA use among younger people may now be frequent enough to affect their health. In California, increasing numbers of adolescents—particularly high school dropouts—are using MA, and MA IDUs tend to be younger than injection users of other drugs (5,6,12,17,25,26). We hypothesize that (1) older people will have poorer health than younger people, (2) MA use will predict poorer health within age categories, and (3) due to cumulation of health risk factors [see Ref. (11)], the relationship of MA use with health status will be stronger at older ages.

Socioeconomic Status (SES)

It is clear that higher SES is related to better health in general population samples (11,27,28). Higher SES appears to predict better health, in large part, through “access to resources that can be used to avoid risks or to minimize the consequences of disease once it occurs” [(29), p. 87]. However, drug abuse, and MA use in particular, may be concentrated among lower-SES groups (12). Therefore, we expect the positive relationship of SES to health in this sample to be weak but still detectable.

Gender

In general population samples, women appear to be less healthy and yet to live longer than men [e.g., Refs. (30,31)]. Among substance users, however, there may be countervailing forces on gender differences in health status. Typically, men use substances more than do women, but also enter substance abuse treatment more frequently [see literature review by Baldwin et al. (32)], perhaps mitigating the effects of substance use on health. When women do enter drug treatment, it is often because their physical health symptoms have become severe (33). Thus, we do not expect to find strong gender differences in health among MA users.

Ethnicity

It is increasingly well documented that people of color tend to have poorer overall health, poorer access to and quality of health care, and more experience of discrimination in the health care system than do Anglos in general population



samples (21,34–36). However, these inequalities are not always apparent among substance users (22,23). Although MA use among Latinos is increasing in California (5,12,14,19), MA is used largely by Anglos (20). Furthermore, ethnic minority MA users may not typify ethnic minority drug users. For example, in San Francisco, men with same-sex partners are overrepresented among minority group MA users (14). On the basis of these findings, we do not expect to find ethnic differences in the health status of our sample.

Marital and Partner Status

Social support, an important component of which is family status, is strongly linked to health (11). In general, married people tend to be healthier than unmarried people (37). We hypothesize that the same is true among MA users. We also expect to find poorer health among MA users who have same-sex partners than among other MA users. Among male drug users, those with same-sex partners may have higher rates of MA use and/or of risky sexual behavior than do others (6,25). In addition, those of either gender with same-sex partners may be at greater risk of poor health than others due to stress associated with discrimination on the basis of sexual orientation (38).

Other Obstacles to Health

Early Trauma

Early exposure to traumatic events is related to numerous measures of poor health outcomes [see literature reviews by Friedman and Schnurr, 1995; Solomon and Davidson, 1997; Wagner et al., 2000 (31,39,40)]. Those who have greater exposure to childhood abuse and household dysfunction also have higher incidences of several specific health conditions (e.g., heart disease and any cancer) and of fair or poor, compared with better, self-rated general health (41). We therefore expect to observe poorer health among MA users who have experienced severe trauma early in life than among others.

Parental Substance Use, Severe Mental Illness, and Early Health Problems

Adults whose parents used substances may have had more stressful relationships with them than other children did with their parents (42) and may have grown up under circumstances that were more conducive to poor health,

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including social network and other social-environmental influences (13). We therefore expect MA users whose parents or parent figures used drugs to have worse health than others. In addition, we expect prior mental and physical health conditions to be related to poorer current health status. Severe mental illness may chronically reduce one's level of functioning, thus impeding the practice of health-promoting behaviors. In fact, psychological distress appears to be related to physical health (10,28). In addition, earlier health conditions might predict later health status, a respondent's awareness of his/her health status, or later substance abuse, which in turn may influence later health (9).

METHODS**Sample and Data**

Data used in these analyses were collected from a random stratified sample selected from adult admissions to service delivery units (SDUs) serving most MA users in the Los Angeles County publicly funded system. The sample was stratified by gender, ethnicity, and modality (residential and outpatient, excluding methadone and detoxification treatment). Admission records were primarily from 1996 (with a few from 1995 and 1997 to increase the size of underrepresented strata) from the California Alcohol and Drug Data System (CADDSS). Invitations to participate were sent to these former treatment clients by the SDUs. Interviews with respondents took place 2–3 years after admission to the sampled (“target”) treatment episode. A 76% interview rate was achieved from the sampled clients who could be located: 365 were interviewed, 88 declined participation, 28 expressed interest but found it impossible to schedule an interview during the study period, 6 had died, and another 151 from the original sample could not be located. A comparison of data available from admission records for the interviewed and not-interviewed (declined, not located, etc.) groups from the sampled admissions showed no significant differences in gender, ethnicity, education, age of first MA use, age at treatment admission, number of prior treatment episodes, status at admission (employed, homeless, pregnant, or under legal supervision), treatment completion, and time in treatment. The current analysis includes 350 of the interviews that had complete data.

Most of the variables used in the analysis, including health, social and demographic factors, background and experiences representing obstacles to health, and some drug use history measures, were collected by using a cross-sectional portion of the survey. Longitudinal data on MA use are from a dynamic portion of the instrument, the Natural History Interview (NHI),



which uses a time line approach to elicit self-reported patterns of substance use and treatment, crime and legal status, and employment across time (43,44). The NHI has acceptable levels of agreement of self-report, urinalysis, and pattern reliability of constructs across time (45–47). In this study, the NHI began at age 14 for all respondents.

Measures of Health Status

Two measures of self-reported health status were used. One was an aggregate measure based on reports of specific conditions, and the other was an overall assessment. The first was derived from questions about the following specific health conditions or categories of conditions: tuberculosis, respiratory problems, extreme weight loss or anorexia, digestive or stomach problems, heart or circulatory system problems, hepatitis, cirrhosis, jaundice, or kidney/liver problems, diabetes, bone or muscle problems, nervous system problems, skin problems, female gynecological or male prostate or urinary problems, sexually transmitted disease, or an immune disorder. For each of these conditions or categories, the respondent was asked whether it affected his/her health in the past 12 months, whether a doctor diagnosed it, and whether he/she had it before starting the use of illegal drugs. If a respondent reported that his/her health was affected by any of these conditions in the past 12 months and that he/she did not have this condition before starting the use of illegal drugs, then the respondent was coded as “reporting a current health condition.” This measure incorporates temporal ordering, which is needed to support potential causality.

The second measure was respondents’ rating of their overall health on a scale of 1 (excellent) to 5 (poor). This measure is similar to measures of overall health used in many studies that predict mortality, morbidity, physical fitness, and health care utilization (21,48–50). We combined ratings of 4 (fair) and 5 (poor) because only nine people reported having poor health.

Measures of Predictors

Substance Abuse History

In a study of two Southern California treatment programs, most MA users were found to have used at least 20 days in the past month (8), and there were no significant differences in the daily amount of MA used among groups defined by days per month of use. Therefore, in this study, prolonged MA use was measured as the number of months since age 14 in which a respondent



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reported using MA on at least 20 days. This measure taps both frequency and duration of use. To construct the measure of prolonged MA use within age categories, we combined two dichotomized variables, age (less than 35 years vs. 35 years or older) and prolonged MA use (36 months or more vs. less than 36 months). The four resulting categories were coded 0 = not in the category, 1 = in the category. Age at first regular drug use was measured as the minimum age reported for regular use of any of the following drugs or drug categories: inhalants, marijuana, hallucinogens, amphetamines, downers, heroin, other opiates, crack, cocaine, tranquilizers, PCP, synthetic drugs, alcohol to intoxication (five or more drinks per sitting), and ecstasy or other designer drugs. Injection drug use was measured using the question, "Have you ever injected any drugs?" (0 = no, 1 = yes).

Social and Demographic Factors

Usual indicators of SES are education, income, and occupation [see, e.g., Refs (27,51)]. Education level was measured as the highest level (among 8) of education that the respondent obtained. For analysis, responses were coded as 0 = not in the category, 1 = in the category for categories of less than high school, high school or GED, trade or technical training beyond high school or GED, and some college or higher. Respondents' reported primary job was coded into a five-category measure of occupation level (unskilled/never worked, semiskilled, skilled, sales or service, and professional), which was omitted from the analysis because it was not significantly related to health outcomes. Total household income in the past year was divided by one thousand. Gender (1 = male; 2 = female) was recorded by interviewers. Respondents' self-reports of ethnicity were coded 0 = no, 1 = yes for the categories African American, Latino (including two Native Americans), and Anglo (including four respondents who specified no ethnicity). Those reporting more than one ethnicity (n = 23) were placed into these categories in the order given above (e.g., an African American/Latino person was categorized as African American). Being married was coded 0 = no, 1 = yes indicating status at the time of the interview. Having a same-sex partner was coded 0 = no, 1 = yes, if the respondent reported ever having lived as married with someone of the same sex, or reported having a same-sex partner either 12 months before treatment or within 30 days before the interview.

Other Obstacles to Health

Experience of sexual abuse before age 15 (0 = no, 1 = yes) was coded from the questions, "Has anyone ever forced you or pressured you to do any



sexual acts against your will?" and "How many times did this happen before you were 15?" Severe mental illness (0 = no, 1 = yes) was coded in response to the question, "Have you ever been diagnosed by a psychiatrist as having schizophrenia, mania, or bipolar disorder?" Because these mental illnesses appear to have origins early in life, we believe that they are not endogenous with adult health outcomes. We also assume that substance-induced mental disorders would have been given a substance-induced diagnosis. Parental drug use was based on a series of questions asking if a family member "ever had a drug- or alcohol-related problem which negatively affected finances, home life, legal status, relationships, etc.?" and was coded yes = 1, no = 0 if a respondent reported problem substance use for parent, stepparent, parent's partner, or foster parents. Reporting of any health conditions prior to drug use (0 = no, 1 = yes) was coded in the same way as the dependent variable representing any current health conditions, but for conditions that occurred prior to illegal drug use. Measures of parental divorce and whether the respondent ever provided sex for money (both coded 0 = no, 1 = yes) were omitted from the analysis because they were not significantly related to health outcomes.

Analytic Methods

Bivariate relationships of the health measures to possible predictors were assessed by using chi square, logistic regression, *t* tests, and/or analyses of variance. Logistic regression was used to predict having a current health condition. A procedure developed by Shtatland, Cain, and Barton (52) was used in the process of selecting a logistic regression model. Least squares regression (OLS) was used to predict self-reported overall health. Self-reported overall health has been treated as a continuous dependent variable in prior research (e.g., Ref. (48), p. 1225), and there were too few cases in the extreme categories ($n = 63$ both for excellent and for fair/poor health) to construct a dichotomous dependent variable that was both meaningful and statistically viable. Therefore, we estimated such a model only as a sensitivity analysis. In the multivariate models, we included measures of major social and demographic positions and measures of factors identified as substantively important in the above literature review. When there was choice about how to measure a particular concept (e.g., SES), we chose measures that had a significant bivariate relationship with a health outcome (e.g., education was chosen over occupation). We used identical sets of variables in models of each dependent variable. We also inspected bivariate correlations to minimize the possibility of multicollinearity, inspected residual plots to detect deviations



from normality, and conducted sensitivity analyses to rule out possible problems with the analyses, as discussed below.

Sample Description

Table 1 shows that 51% of the respondents had prolonged MA use (i.e., use on at least 20 days per month for at least 36 months since age 14). Respondents from ages 35 to 52 (as opposed to those from ages 18 to 34) constituted 37% of the sample. Prolonged MA use is approximately equally distributed between the two age categories. Forty-four percent of the sample were female, 49% were Anglo, and 68% had a high school education or more. Seventeen percent were married. One third of the sample experienced early sexual abuse, and 19% were severely mentally ill.

To illustrate the relative health status of our sample, we present some comparisons with other data sets. We expected self-reported health in our sample of MA users to be worse than self-reported health in the general population. Indeed, compared with general population data from the National Health Interview Survey (NHIS) (53), fewer members of our sample reported their health as “excellent” or as “very good” (42% vs. 68% of the NHIS sample between ages 18 and 64). This discrepancy is consistent with that found in a Florida sample in which only 7% of the IDUs and 13% of the other drug users rated their health as excellent, compared with 27% of the non-drug users (22). Their own health was rated as excellent by 18% of our sample and 37% of the NHIS sample. We also note that there is a correlation of 0.29 ($p < 0.0001$) between the two measures of health that we analyze in this article, suggesting that the measures are reasonably consistent but also tap somewhat different phenomena.

RESULTS

Bivariate Analyses

Table 1 displays bivariate relationships of dependent with independent variables. For both measures of health, those who had greater prolonged MA use and were older reported poorer health than did others. Earlier regular use of drugs and injection drug use also were significantly related to having a current health condition. Proportionately more of those with trade or technical training beyond high school reported having a current health condition than did those with less than a high school education. In addition, having a current

Table 1. Descriptive statistics and bivariate relationships (percentage or mean, (SD), and [range]).

Analysis variables (N = 350)	Percentage or mean, (SD), and [range] in sample	Percentage or means (SDs) with any current health condition ^a	Odds ratio: any current health condition	Percentage reporting health as:			
				Excellent (= 1)	Very good (= 2)	Good (= 3)	Fair/poor (= 4)
Health							
Any current health condition		50.9					
Overall health	2.6 (1.0) [1–4]			18.0	24.0	38.9	19.1
Substance abuse history							
Prolonged MA use							
No. of months used > 20 days	50.2 (47.8) [0–255]	N: 42.5 (39.4) Y: 57.6 (53.8)	1.01**	35.3 (36.1)	57.8 (51.2)	50.9 (50.2)	53.4* (45.8)
Used > 20 days for < 36 months	48.9	43.9	Ref. cat.	24.6	18.1	40.4	17.0**
Used > 20 days for ≥ 36 months	51.1	57.5	1.74*	11.7	29.6	37.4	21.2
Age by prolonged MA use							
Age < 35, use < 36 months	32.0	35.7***	Ref. cat.	27.7	17.0	35.7	19.6*



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Age < 35, use ≥ 36 months	30.9	51.8	1.94*	13.0	31.5	37.0	18.5
Age ≥ 35, use < 36 months	16.9	59.3	2.62**	18.6	20.3	49.2	11.9
Age ≥ 35, use ≥ 36 months	20.3	66.2	3.52***	9.9	26.8	38.0	25.4
Ever injected drugs							
No	53.1	43.0	Ref. cat.	21.5	26.3	36.6	15.6
Yes	46.9	59.8	1.97**	14.0	21.3	41.5	23.2
Age 1 st reg. use of any illegal drug or alcohol to intox ^b	14.6 (4.0) [5–38]	N: 15.1 (3.8) Y: 14.2 (4.0)	0.94*	15.1 (4.6)	14.9 (4.1)	14.3 (3.6)	14.4 (3.8)
Social and demographic factors							
Age	32.6 (6.9) [18–52]	N: 31.3 (6.4) Y: 34.0 (7.1)	1.06***	30.8 (6.8)	32.7 (6.2)	32.9 (6.9)	33.7 (7.6)
< 35 years	62.9	43.6	Ref. cat.	20.4	24.1	36.4	19.1
≥ 35 years	37.1	63.1	2.21***	13.8	23.8	43.1	19.2
Education							
< HS	31.7	41.4***	Ref. cat.	20.7	21.6	36.0	21.6
HS	20.6	45.8	1.20	15.3	33.3	38.9	12.5
Trade/tech	15.7	74.6	4.14***	12.7	20.0	40.0	27.3

(continued)



Table 1. Continued.

Analysis variables (N = 350)	Percentage or mean, (SD), and [range] in sample	Percentage or means (SDs) with any current health condition ^a	Odds ratio: any current health condition	Percentage reporting health as:			
				Excellent (= 1)	Very good (= 2)	Good (= 3)	Fair/poor (= 4)
Some college or more	32.0	51.8	1.52	19.6	22.3	41.1	17.0
Past year household income/1000 ^b	26.2 (37.6) [0–289]	N: 24.5 (35.0) Y: 27.9 (39.9)	1.00	29.6 (46.4)	29.2 (42.3)	26.0 (35.2)	19.8 (24.0)
Gender							
Male	56.0	48.0	Ref. cat.	20.9	25.0	37.8	16.3
Female	44.0	54.6	1.30	14.3	22.7	40.3	22.7
Ethnicity							
African American	17.4	52.5	1.03	13.1	21.3	45.9	19.7
Latino	33.4	48.7	0.89	16.2	26.5	41.9	15.4
Anglo	49.1	51.7	Ref. cat.	20.9	23.3	34.3	21.5
Married							
No	83.2	52.6	Ref. cat.	19.6	22.3	38.5	19.6
Yes	16.8	42.4	0.66	10.2	32.2	40.7	17.0
Same-sex partner							
No	86.9	48.7	Ref. cat.	18.8	23.4	39.5	18.4
Yes	13.1	65.2	1.98*	13.0	28.3	34.8	23.9



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Other obstacles to health							
Sexual abuse before age 15							
No	66.9	42.7	Ref. cat.	22.2	26.1	36.3	15.4**
Yes	33.1	67.2	2.75***	9.5	19.8	44.0	26.7
Severe mental illness (diagnosis of schizophrenia, mania, bipolar)							
No	81.1	45.4	Ref. cat.	18.7	25.7	38.7	16.9
Yes	18.9	74.2	3.46***	15.2	16.7	39.4	28.8
Parental drug use							
No	43.7	41.8	Ref. cat.	19.0	20.3	44.4	16.3
Yes	56.3	57.9	1.91**	17.3	26.9	34.5	21.3
Any health condition prior to drug use							
No	78.0	49.1	Ref. cat.	20.5	24.5	39.2	15.8**
Yes	22.0	57.1	1.38	9.1	22.1	37.7	31.2

*** $p < 0.001$. ** $p < 0.01$. * $p < 0.05$.

^aSignificance levels for percentages (based on χ^2) or mean differences (based on t tests) are identical to those for odds ratios unless otherwise specified.

^bFor continuous variables, means and standard deviations are reported for the overall sample and by group (N = had no reported health conditions after drug use, Y = had at least one reported health condition after drug use).



health condition was reported more frequently by those who experienced early sexual abuse, had a severe mental illness, reported having a same-sex partner, or reported parental drug use than by those without these characteristics.

Multivariate Analyses

Table 2 displays the multivariate results. Although models for both dependent variables are significant ($p < 0.001$), more variation in reporting a current health condition (pseudo- $R^2 = 0.22$) is explained by the predictors than is variation in overall health (adjusted $R^2 = 0.07$). We first discuss these findings in more detail, and then we examine how selected predictors of reporting a current health condition are related to the specific health conditions on which this measure is based.

Substance Abuse History

We hypothesized that 1) the older people in our sample would have poorer health than the younger people; 2) more prolonged MA use would be related to poorer health within age categories; and 3) the relationship between prolonged MA use and health status would be stronger among older than among younger people. Part 1) of this hypothesis is supported. Compared to younger people with less prolonged MA use, the odds of reporting a current health condition were significantly greater for each of the other categories. Part 2) of the hypothesis is partially supported because the odds of reporting a current health condition increased with each age or MA use increment. However, when we changed reference categories in the model to see which of these group differences were significant, the results (not shown) indicated that the odds of reporting a health condition differed significantly ($p < 0.05$) only between age groups (but see the discussion in the Sensitivity analysis section below). Part 3) of the hypothesis is refuted. Although the odds of reporting a current health condition are 62% greater for younger people with prolonged MA use than for other younger people, the corresponding differential in odds is only 23% among older people (4.39/3.57). This means that prolonged MA use makes a greater (although insignificant) difference in the odds of reporting a current health condition among younger than among older people. We also found that earlier regular use of a substance predicted a greater chance of reporting a current health condition. The only drug use history indicator predicting poorer overall health was injection drug use. This finding differed from the bivariate relationship, which was insignificant.



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Table 2. Regression models predicting any current health condition and overall health (N = 350).

Explanatory variables	Model 1		Model 2	
	Any current health condition (logistic regression) ^a		Overall health (OLS regression; 1 = excellent to 4 = fair or poor) ^b	
	Odds ratio	95% confidence interval	Coefficient	S.E.
Substance abuse history				
Age by prolonged MA use				
Age < 35, use ≥ 36 months	1.62	0.87–3.02	0.13	0.14
Age ≥ 35, use < 36 months	3.57**	1.65–7.71	0.10	0.16
Age ≥ 35, use ≥ 36 months	4.39***	2.12–9.09	0.28	0.15
Ever injected drugs	1.51	0.90–2.52	0.24*	0.11
Age 1 st reg. use of illegal drug or alcohol to intox.	0.93*	0.87–1.00	–0.01	0.01
Social and demographic factors				
Education (vs. < high school)				
High school	1.33	0.67–2.63	–0.08	0.15
Trade or tech. training	3.65**	1.61 – 8.27	0.08	0.16
Some college or more	1.57	0.84–2.95	–0.07	0.14
Past year household income/1000	1.00	1.00–1.01	–0.002	0.001
Female	1.37	0.81–2.31	0.22	0.11
Ethnicity (vs. Anglo)				
African American	0.90	0.44–1.86	0.21	0.15
Latino	1.35	0.77–2.38	0.10	0.12
Married (vs. not married)				
Same-sex partner	1.03	0.47–2.25	–0.17	0.17
Other Obstacles to Health				
Sexual abuse before age 15	1.89*	1.07–3.35	0.29*	0.12
Severe mental illness (diagnosis of schizophrenia, mania, bipolar)	2.53**	1.28 – 5.02	0.13	0.14
Parental drug use	1.88*	1.14–3.10	–0.10	0.11
Any health condition prior to drug use	1.05	0.58–1.90	0.35**	0.13

*** $p < 0.001$. ** $p < 0.01$. * $p < 0.05$.^a Pseudo- $R^2 = 0.21$, likelihood ratio $\chi^2 = 83.0$ ($p < 0.0001$), Hosmer & Lemeshow Goodness of Fit $\chi^2 = 5.99$ ($p < 0.648$).^b Adjusted $R^2 = 0.07$, $F_{(18,331)} = 2.41$ ($p < 0.002$).



Social and Demographic Factors

Compared with those having less than a high school education, those with trade or technical training beyond high school were more likely to report a current health condition, as the bivariate analysis also shows. Further descriptive analysis indicated that, compared with groups having other educational levels, in this group there was a higher rate of early sexual abuse (51%, vs. no more than 32% in other groups), a higher rate of reporting health conditions prior to drug use (36%, vs. no more than 26% in other groups), and a higher rate of severe mental illness (29%, vs. no more than 22% in other groups). In addition, there was a predictor of health status in the multivariate model that was not observed in the bivariate analyses—those who were married were less likely than others to report a current health condition. Sensitivity analyses did not indicate any one factor (e.g., multicollinearity) that appeared to account for the appearance of this significant relationship. In the analysis of overall health status, sociodemographic factors were not strong or significant predictors.

Other Obstacles to Health

There were significant relationships between reporting a current health condition and early sexual abuse, being severely mentally ill, and experiencing parental drug use, and these were consistent with bivariate analyses. However, in contrast to the bivariate analysis, having a same-sex partner was not related to reporting a current health condition.

Overall health was significantly related to early sexual abuse and to reporting a health condition before drug use in both the multivariate and bivariate analyses. However, in contrast to the bivariate findings, having a severe mental illness was not related to overall health.

Specific Health Conditions

To better understand the analysis of reporting a current health condition, we examined selected bivariate relationships of predictors with the specific health conditions used in constructing this dependent variable (see Table 3). Because relatively few people reported any specific condition, the cell sizes in this table are relatively small and there are few significant differences. Nonetheless, some of the findings are illuminating. Table 3 provides further evidence that it is reasonable to specify age and MA



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Table 3. Percentage reporting current specific conditions by selected predictors (N = 350).

Health condition starting since onset of drug use	Total	Prolonged MA use (>20 days in 36 or more months)		Age		Age (young = Y, mature = M) by prolonged MA use (lower use level = L, higher use level = H)				Ever injected		Early sexual abuse		Severe mental illness (diagnosis of schizophrenia, mania, bipolar)	
		No	Yes	<35	≥ 35	YL	YH	ML	MH	No	Yes	No	Yes	No	Yes
		Tuberculosis	1.7	1.8	1.7	0.9	3.1	1.8	0.0	1.7	4.2	1.1	2.4	2.1	0.9
Respiratory problems	14.6	12.9	16.2	13.6	16.2	15.2	12.0	8.5	22.5	13.4	15.9	11.1	21.6*	12.7	22.7
Excessive weight loss	4.9	4.7	5.0	5.9	3.1	5.4	6.5	3.4	2.8	3.2	6.7	5.6	3.4	5.3	3.0
Digestive problems	11.4	9.9	12.8	9.6	14.6	8.9	10.2	11.9	16.9	9.1	14.0	10.7	12.9	9.2	21.2**
Heart/circulatory problems	9.4	6.4	12.3	7.7	12.3	3.6	12.0	11.9	12.7	7.0	12.2	8.6	11.2	8.4	13.6
Hepatitis, kidney/liver problems	8.6	6.4	10.6	7.3	10.8	5.4	9.3	8.5	12.7	3.2	14.6***	6.0	13.8*	6.7	16.7*
Diabetes	1.1	1.8	0.6	0.9	1.5	0.9	0.9	3.4	0.0	1.1	1.2	0.8	1.7	1.1	1.5
Bone or muscle problems	15.4	11.7	19.0	14.1	17.7	8.0	20.4	18.6	16.9	15.0	15.8	13.2	19.8	13.7	22.7
Nervous system problems	8.3	8.2	8.4	5.5	13.1*	5.4	5.6	13.6	12.7	5.9	11.0	7.3	10.3	6.7	15.2*
Skin problems	10.3	11.1	9.6	11.9	7.7	12.5	11.2	8.5	7.0	8.1	12.9	8.6	13.8	9.5	13.6
Female/male genitourinary problems	7.2	3.5	10.7*	6.8	7.8	3.6	10.3	3.4	11.4	6.0	8.5	4.3	12.9**	6.4	10.8
STD	3.7	3.5	3.9	3.6	3.9	3.6	3.7	3.4	4.3	3.2	4.3	3.0	5.2	3.2	6.2
Immune disorder	6.0	5.8	6.2	4.6	8.5	5.4	3.7	6.8	9.9	3.2	9.2*	4.7	8.7	4.2	13.8**

*** $p < 0.001$. ** $p < 0.01$. * $p < 0.05$.



interactively in analyzing reporting of a current health condition. The prevalence of some potentially serious conditions, such as heart or circulatory problems and bone or muscle problems, appears to be greater among those who either are older or have used more MA. Other conditions, such as genitourinary problems, appear to have a greater prevalence among MA users regardless of age. Still others, such as nervous system problems, appear to be related to age but not to MA use.

We also note that the greater prevalence in our sample of hepatitis, kidney, or liver problems, and of immune disorders (including HIV + serostatus) among IDUs is consistent with previous findings (12,19). Moreover, victims of early sexual abuse and those who were severely mentally ill had a significantly greater prevalence than did others of a greater number of specific health conditions (three and four, respectively) than we found for other predictors.

Sensitivity Analyses

Key sensitivity analyses are reported in Appendix Table A1. We conducted sensitivity analyses to explore the relationship to reporting a current health condition of the age-by-prolonged MA use variable and to assess its specification. When the age-by-prolonged MA use categories (like those in Table 2, model 1) were substituted in a more parsimonious model of reporting a current health condition (see Table A1, model 1), we found a significantly greater chance of reporting a current health condition among young people with prolonged MA use than among young people without prolonged use, but still no significant difference existed between the two groups of older people in this measure of health status. When 11 outliers (i.e., Pearson residual > 2 in absolute value) were eliminated from the estimated model 1 of Table 2, we also found a significant difference in this outcome between the two younger groups of MA users. When the dichotomies representing prolonged MA use and age were entered into the model additively rather than interactively, prolonged MA use had no relationship to reporting a current health condition in the full model of Table 2. However, in a reduced model including the same predictors as model 1 of Table A1, both greater age and greater prolonged MA use (specified additively) were significant predictors of reporting a current health condition.

We also tested the specification of overall health by dichotomizing that measure (1 = excellent; 0 = less than excellent) and estimating a reduced logistic regression model, displayed in model 2, Table A1. The results for this

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model show that both age groups with prolonged MA use were significantly less likely to report excellent health than were younger adults without prolonged MA use. Older people without prolonged MA use were no less likely to report excellent health than were their younger counterparts. Thus, in this model, prolonged MA use, but not age, appears to affect the self-reporting of overall health.

In addition, we conducted sensitivity analyses to rule out possible alternative explanations for the age-by-prolonged MA use effects. Specifically, we included in the model (each separately) the number of drugs ever used regularly (including and excluding tobacco, alcohol, and marijuana), regular use of only tobacco, alcohol, and/or marijuana in addition to MA ($n = 20$), and MA use within the previous 30 days (see Chen, Scheier, and Kandel, 1996 (9)). None of these variables significantly predicted reporting a current health condition or overall health, and other findings did not change substantially when they were included, although substance use history effects were somewhat attenuated by the addition to the model of the number of drugs used regularly.

DISCUSSION

We investigated whether prolonged MA use predicted two self-reported measures of health status—reporting a current health condition and overall health—in a sample of Los Angeles County MA users who have been in drug treatment. Significant multivariate models were estimated for the two health status outcomes. The models included controls for the effects of other health-related behaviors (i.e., substance use history) and social factors (i.e., social and demographic positions and early obstacles to health). The models better predicted reporting a current health condition than they did overall health.

As we hypothesized, the likelihood of participants in this study reporting a current health condition that was not present prior to illegal drug use was related to being older. Prolonged MA use also was related to reporting a health condition within age categories, but these relationships were not significant in the full model. Contrary to what we hypothesized, the relationship between reporting a current health condition and prolonged MA use was stronger among younger than among older users. Reporting a current health condition was also related to younger age at first use of any illegal drug (excluding marijuana). Social factors that predicted reporting a current health condition were being unmarried and having trade or technical training beyond high school



(as opposed to having less than a high school education). Obstacles to health that predicted this measure of health status included early sexual abuse, having a serious mental illness, and experiencing parental drug use. In addition, the findings show that worse overall health was found among those who had ever injected drugs, those who experienced early sexual abuse, and those who reported that they had any health conditions prior to starting drug use.

Why is reporting a current health condition better predicted by our model than overall health? There is considerable evidence that self-reported overall health predicts diminished levels of functioning and mortality, particularly in elderly samples, even when controlling for the presence of chronic conditions (49). The oldest member of our sample was 52—still relatively young to experience a marked decline in health. Particularly in a young and middle-aged group of people, the presence of specific health conditions may not be related to substantially reduced levels of functioning or to impairment. Indeed, we included both outcomes, in part, as a check on self-reporting bias—specifically, on the possibility that those who were more aware of their health conditions would be those most likely to report poor health on both measures. Thus, the fact that we get different results for the two dependent variables and that they are only moderately correlated suggests that they measure different things, and not just respondents' preconceptions about their health.

It is noteworthy that young people with prolonged MA use were more likely than other young MA users to report having a current health condition. The specific health conditions for which we observed large percentage differences between these two groups—heart and circulatory problems, bone or muscle problems, and male or female genitourinary problems—have potentially serious or chronic consequences. Therefore, it may be especially important to intervene among younger people to reduce MA use.

Contrary to our expectations, the only significant relationship to health status of SES was that those with trade or technical training beyond high school were more likely to report a current health condition than were those with less than a high school education (the reference category for all education levels). It appears that in our sample, people with trade or technical training have had greater exposure to trauma than have others and, partly as a result of this, may have had more obstacles to advancing their education. Thus, exposure to trauma among MA users, and perhaps among others (41), may operate in the way that lower SES is hypothesized to operate—by reducing one's ability to mobilize resources that are



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valuable in maintaining health (29). However, an alternative interpretation is that, because we do not have measures of parental SES or many other sociodemographic background measures, our measures of obstacles to health may have picked up some of the long-term influences on health status of such factors.

The finding that those who were married were less likely than others to report a current health condition reflects what is found in more general samples, and suggests that social support may improve the health outcomes of drug users. Conversely, less salutary social network influences, as our findings for parental drug use may represent, can have the opposite effect. Indeed, parental and partner substance use have been found to be more common among MA users than among cocaine users (8), suggesting that even among drug users, MA users may experience more social stressors on health.

The variable that had the most consistent relationship with both measures of health status was early sexual abuse. Early sexual abuse was associated with three specific health conditions in our sample—more than all other predictors except severe mental illness. These findings are consistent with previous literature that documents a number of specific health conditions associated with early sexual abuse independently of apparent medical causes [see Friedman and Schnurr, 1995 (39), for a literature review]. Moreover, the relationship of early sexual abuse to overall health suggests that the former might also predict phenomena that the latter predicts: impairment, declines in functioning, and possibly, a greater risk of mortality by a specific future time (49). This interpretation is plausible, given the finding that exposure to multiple types of abuse in childhood is related to common causes of death in the United States (41).

One limitation of this study is that our sample consists of MA users who have been in treatment at least once. A sample of people who have been treated for drug abuse is likely to be self-selected in a number of ways. Chen, Scheier, and Kandel, 1996 (9) note that drug users who have been in treatment may have patterns of use that are more chronic than those of other users, and following from their awareness of their problems with drugs, they may also be more aware of their other health problems. In a follow-up interview currently in the field, we are collecting more extensive background information on parental SES and also collecting data from a never-in-treatment sample of MA users. These new data will allow us to address such concerns more fully in the future.

A second limitation of this study is that it only focuses on the individual level of analysis. Therefore, the analysis cannot detect



structural effects, such as effects of the social environment on drug use behavior and on health (13,54). Such social environmental effects may include those of SES at a different level of analysis (e.g., neighborhood SES).

A third limitation of this study is that our analysis relies on self-reported measures of health, which reflect differential awareness and may not precisely match provider-diagnosed conditions (9). A fourth limitation of this study is that, although we control for drug use history and some other health risks, there are many health risks whose effects we do not include in the model. For instance, although we have the advantage of having retrospective information on MA use that goes back to age 14, we have such retrospective information on the use of some other drugs that was not incorporated into the analysis. A fifth limitation of this study, as observed by Chen, Scheier, and Kandel, 1996 (9), is that early health problems may lead to drug use, as well as drug use leading to health problems. Although we control for reports of any health conditions that began prior to drug use, we do not model this possible reciprocal causation.

In summary, our results suggest that intervention to reduce MA use would decrease the social costs of MA use by reducing medical expenditures and other consequences of disability, such as reduced work effort. On the one hand, this could provide an important reduction in expenditures among the large, aging baby boom cohort. On the other hand, our findings suggest that the impact of prolonged MA use on health is even greater among younger people, and therefore that the reduction of MA use in this group may promote their later health. Because MA use appears to be increasing among adolescents, particularly those who drop out of high school (12), the effects of MA use on general population health may also increase as this cohort ages.

Our results also suggest, as have other studies (e.g., Ref. (41)), that early experiences are instrumental in setting the stage for later health status. This suggests that structural equation modeling would be an appropriate technique for future research in which more measures can be temporally ordered. Our results imply that future research could productively consider respondents whose ages range more widely, and whose histories of the use of other drugs can be precisely measured. More generally, our results suggest that MA treatment services could be improved by a greater understanding of how early experiences influence later health among MA users.

APPENDIX: SENSITIVITY ANALYSES

Table A1. Sensitivity analyses predicting any current health condition and overall health (N = 350).

Explanatory variables	Model 1 Any current health condition (logistic regression, reduced model) ^a		Model 2 overall health (logistic regression, 1 = excellent, 0 = other, reduced model) ^b	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Substance abuse history				
Age by prolonged MA use				
Age < 35, use ≥ 36 months	1.85*	1.03–3.32	0.33**	0.16–0.70
Age ≥ 35, use < 36 months	3.58***	1.75–7.29	0.54	0.24–1.25
Age ≥ 35, use ≥ 36 months	4.86***	2.44–9.68	0.27**	0.11–0.70
Ever injected drugs	—	—	0.76	0.41–1.42
Age 1 st reg. use of illegal drug or alcohol to intox.	0.94*	0.88–1.00	1.02	0.95–1.10
Social and demographic factors				
Education (vs. < HS)				
High school	—	—	—	—
Trade or tech. training	—	—	—	—
Some college or more	—	—	—	—
Past year household income/1000	—	—	—	—
Female	—	—	—	—
Ethnicity (vs. Anglo)				
African American	—	—	0.48	0.20–1.16
Latino	—	—	0.55	0.28–1.08
Married (vs. not married)	0.49*	0.26–0.92	0.57	0.22–1.46
Same-sex partner	—	—	—	—
Other obstacles to health				
Sexual abuse before age 15	2.20**	1.31–3.70	0.39*	0.18–0.84
Severe mental illness (diagnosis of schizophrenia, mania, bipolar)	2.61**	1.35–5.06	1.09	0.47–2.50
Parental drug use	1.82*	1.12–2.95	1.15	0.63–2.10
Any health condition prior to drug use	—	—	0.41*	0.17–0.99

^a *** $p < 0.001$. ** $p < 0.01$. * $p < 0.05$.

^b Pseudo- $R^2 = 0.17$, likelihood ratio $\chi^2 = 65.2$ ($p < 0.0001$), Hosmer & Lemeshow Goodness of Fit $\chi^2 = 6.76$ ($p < 0.563$).

^c Pseudo- $R^2 = 0.09$, likelihood ratio $\chi^2 = 34.1$ ($p < 0.0006$), Hosmer & Lemeshow Goodness of Fit $\chi^2 = 8.75$ ($p < 0.364$).



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