

# **Follow-up Study of Crack Cocaine Users: Situation of the Patients after 2, 5, and 12 years.**

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## **Abstract**

**Objectives:** To follow-up 131 crack users and examine drug use, treatment experience, employment status, and mortality at 2, 5 and 12 years. **Methods:** Consecutive crack dependent patients were re-interviewed in 1995-1996, 1998-1999 and 2004-2005. **Results:** Of those subjects not using cocaine at 2 years, 19 (63%) were still abstinent at 5 years. Almost half of the users were abstinent at the same period. The abstinent group was still the most prevalent at 12 years. Twenty-seven (20.6%) patients had died by the 12 years follow-up with homicide, being the commonest cause (n=16). After 2000, however, it declines sharply with only 2 deaths in seven years. **Conclusions:** There was a progressive movement towards abstinence over the follow-up period, with the evidence that once abstinence had been achieved it was maintained. On the other hand, the mortality rate was extremely high, and probably more related with socioeconomic factors, instead of the drug use itself.

**Keywords:** crack-cocaine, follow-up, mortality, treated patients

## **Introduction**

Complications related to crack consumption represent a public health problem, especially in the Americas and Europe (1, 2). Cocaine crack was brought to Brazil in the late 1980's (3, 4) and reached the less economically favored people, particularly the adolescents (4-6). During the next decade the crack consumption increased, and the treatment services were sought by the majority of crack users (3). In addition, most individuals using cocaine via injection and inhalation have changed these original administration routes because of AIDS and crack's low price, respectively (7). Although a small portion of the general population has been affected (8, 9), overdose, criminality, and violence involving young individuals have transformed the crack cocaine dependence into a public health problem of extreme importance (2).

Little is known about the natural history of crack consumption. Most longitudinal studies have investigated those outcomes related to the efficacy of therapeutic interventions (10-13). The existing data on mortality and death cause are still inaccurate. A 2-year follow-up study of 131 crack cocaine users who had been treated in São Paulo between 1992 and 1994 was carried out in October 1995 and December 1996 (14). The authors have found a very high annual mortality rate, mainly caused by AIDS and homicides. These findings had encouraged us to go on following up the same subjects, but the mortality trend was found to be extremely high over that 5-year follow-up (15-17). In the face of the data obtained in the two previous follow-ups, a third one aiming to investigate the same sample over a period

of 12 years has been carried out and will be finished soon. In addition to the extended follow-up period, the data collection procedures were also improved. Variables such as lifetime drug use (crack and other substances), changes in the administration route (cocaine), crack consumption, and high-risk sexual behavior were all included. Also, a complementary qualitative methodology was used in order to obtain different life histories of consumption/abstinence of crack cocaine.

## **Methods**

### *Subjects*

The subjects who had been treated between May 1992 and December 1994 were initially identified via their admission registers available in the Alcohol and Drug Detoxification Unit of the Taipas General Hospital (TGH) and then consecutively selected according to specific diagnosis criterion for crack cocaine addiction (ICD-10). A total of 131 subjects were treated during that period and their diagnosis had been established by means of clinical interviews with psychiatrists responsible for their treatment.

### *The Taipas General Hospital (TGH)*

The Taipas General Hospital is located in a northern district of São Paulo City and has a multidisciplinary unit for alcohol and drug detoxification. The program is sought by patients of all ages, and during the follow-up period, it was the only detoxification service for chemical dependents provided by a

public institution in the whole city. The detoxification program has duration of two weeks and is followed by outpatient referral.

### *Procedures*

The procedures adopted by the present study were approved by the Committee of Ethics in Research of the Federal University of São Paulo (832/05). In the first follow-up study (1995-96) (14) the contact with patients or relatives had occurred predominantly by telephone calls. The authors had also reviewed the patients' medical records in order to update any information on their previous personal situation and admission period. Those patients not found by using telephone calls (n = 44) had been sent telegrams indicating a practitioner to be contacted in the UNIAD. Patients who had been declared dead or not been found by their families were traced via official records so that death certification could be obtained. In the end, 103 patients (78.6%) had their whereabouts known.

In the second follow-up study (1998-99) (17), some additional strategies for locating patients had been adopted. As a result, those patients who could not be found by telephone calls nor by telegrams were interviewed at their homes (n = 17). The investigators were also able to update any information by consulting the patient's neighbors (n = 31). An online telephone catalogue was helpful in looking for some patients (n = 5). Finally, a small group of patients who were thought to be disappeared were found by examining the Brazilian imprisonment system (n = 4). Such strategies helped reducing the

number of absent patients from 28 to 7 in comparison to the sample studied in the first follow-up, thus totaling 124 patients (94.6%).

The third follow-up study (2005-06) was based on a data review of the patients seen during the second follow-up. Online telephone catalogue and medical records obtained from the Taipas General Hospital were used for updating this information so that a new contact with these same patients could be established.

One of the innovations provided by this third follow-up was that telephone calls were no longer used as the main form of contacting the patients, since home visits enabled high-quality interviews and consequently more accurate information. In addition, relatives of imprisoned, deceased, and disappeared patients were also interviewed (data on prior-year outcomes), which had not been possible before.

Telephone numbers and addresses not updated ( $n = 42$ ) had to be actively sought by the investigators. Should such information was not achieved, then the investigator had to walk around the neighborhood in order to obtain any information on the patient's whereabouts or his or her family. In this way, it was possible to find some relatives and/or patients, who were promptly interviewed ( $n = 13$ ). The investigators had also used MSN and Orkut in an attempt to locate the missing patients. Two ones were contacted, but no answer was obtained. Currently, the investigators are searching the

imprisonment system, and 101 imprisoned patients (77.1%) have already been located.

### *Statistic Analysis*

A descriptive analysis was used to summarise the patient profiles. The mean values were compared between the groups by using the t-test, whereas the categorical data were analysed by using the chi-square test. The data were normally distributed. Mann-Whitney U test was used for analysing the parametric data, despite the high biases.

For the second follow-up study, the gross mortality rate was obtained by dividing the number of death by the total number of individuals in the sample. The mean annual rate mortality was calculated by dividing the gross mortality rate by the number of follow-up years. These values were expressed as number of deaths *per* 1000 individuals. This value was then adjusted according to gender and age by applying the respective indices to their distribution in the São Paulo City (direct method) in order to eliminate any difference in the rates resulting from differences in both populations. Gender and age distribution for the inhabitants of São Paulo City and their expected mortality rates were obtained from records provided by the State of São Paulo Data Analysis System Foundation (SEADE). The excess mortality rate was calculated as being the difference between observed and expected mortality rates. The standardised mortality rate (SMR) was defined as being the ratio between both mortality rates. Survival analysis was carried out by

using the Kaplan-Meier method. The analyses were performed by using the SPSS (Statistical Package for Social Scientists) program for Windows, version 8.0.1.

## **Results**

### *Data Collection and Forms of Contacting the Patients*

Data collection had its duration significantly reduced in the second follow-up study in comparison to the third one: from approximately 24 months to 13 months.

While the two first follow-up studies had predominantly contacted the patients by means of telephone calls (n = 102; 99%, and n = 88; 79.3%, respectively), the third follow-up has largely involved home visits (n = 67; 66%). Regarding the data sources, the two first follow-ups had relied upon interviews with the patients' relatives (n = 80; 77.6%, and n = 65; 58.6%, respectively), whereas the third follow-up has been mostly obtained information by interviewing the patients (n = 43; 67%). Such an approach allowed achieving more detailed and accurate information as well as referrals for treatment whenever needed. Those patients known to be dead, imprisoned, or disappeared (n = 37) had their respective relatives not been included here.



### *Detoxification*

In general, the patients who have been hospitalised were young, single, and of low educational level. Most of them were unemployed as well. The demographic details of the sample are outlined in **Table 1**. The mean onset age of using crack cocaine was 22.6 years (SD = 6.93, range 12-42 years). Two-thirds of the patients had used crack for the first time before the age of 18.

Nevertheless, crack cocaine was not the first drug among the majority of the users (n = 119; 99.2%), who reported that cocaine (n = 99; 83.2%) and marijuana (n = 81; 68.1%) had already been consumed earlier. Endovenous injection of cocaine was reported by almost one-third of the patients (n = 35; 28.7%) even before seeking the Taipas General Hospital.

### *Two-Year Follow-up*

The first follow-up study located 103 patients (78.6%). Among them, 50 (38.2%) had consumed crack cocaine during the prior year, 29 (22.1%) were abstinent during the same period, nine (6.9%) were imprisoned, two (1.5%) were disappeared, and 13 (9.9%) had died.

Little more than 15% (n = 12) of the crack users attended schools and 70.9% (n = 56) were employed. Most of them (n = 46; 58.2%) have sought some type of treatment after being discharged, for hospitalisation is the most

frequently used treatment modality (n = 26; 56.5%), followed by outpatient interventions (n = 16; 34.8%).

The high annual mortality rate (38 deaths per 1000 inhabitants) was an important issue raised in the present study as 11% of the sample had died (n = 13). Regarding the causes of death, most of the patients were killed by firearms (n = 07; 53.84%), whereas AIDS (n = 5; 38.46%) and overdose (n = 1; 7.69%) accounted for the remaining deaths.

#### *Five-Year Follow-Up*

In the second follow-up study, the changes in consumption and abstinence were compared to those observed in the prior follow-up: five years after the hospital discharge, the majority of patients (n = 52; 39.7%) consisted of individuals who had used no crack cocaine during the prior year. Among the abstinent patients studied in the first follow-up (n = 29), 63% of them remained under such a condition (n = 18) after five years, whereas 46% of the crack users (n = 50) were also found to be abstinent (n = 23). Therefore, the user group was reduced to 28 individuals (21.4%). Regarding the remaining patients, 16 (12.2%) were imprisoned (robbery and drug traffic as main causes), five (3.8%) were disappeared, and 10 were dead, thus increasing the number of deaths to 23 (17.6%).

On the other hand, either inpatient or outpatient treatment had been sought by a similar number of patients (n = 56; 52.3%), mainly when they relapsed.

Regarding the employment situation, more than two-thirds of the sample were regularly working (n = 56; 70%) either in formal occupations (n = 24; 42.8%) or full time work (n = 49; 87.5%) during the prior 12 months. No differences in the occupational level were found between crack users and abstinent patients. The low educational level was similar to that observed in the first follow-up, since a small portion of the sample (n = 11; 13.7%) had been studying during the same period.

#### *Mortality in the Second Follow-Up*

A gross mortality rate of 35.1 deaths *per* 1000 inhabitants was observed. The annual adjusted mortality rate for the sample (gender and age adjusted to the São Paulo City population by using a direct method) was of 24.9 deaths *per* 1000 individuals. The expected mortality rate for the São Paulo City population was of 3.3 deaths *per* 1000 inhabitants. Therefore, the *excess mortality rate* and the *standardised mortality rate* (SMR) were, respectively, of 21.6 and 7.6 deaths *per* 1000 inhabitants. A survival analysis showed that the 5-year survival probability following the treatment was of 0.80 (95% CI = 0.77 to 0.84) (see **Figure 1**), that is, 20% of the sample were at risk of death at the end of the 5-year period.

The majority of the patients had died due to external causes (n = 16; 69.5%) – predominantly homicides (n = 13; 56.5%); only two deaths involved overdose (8.7%) and one involved drowning (4.3%). All natural deaths (n = 7;

30.4%) were related to sexually communicable diseases such as AIDS (n = 6; 26.1%) and hepatitis B (n = 1; 4.3%).

### *12-Year Follow-Up*

The third follow-up study has now reached the final stage of data collection. As there are a few patients to be located in the Brazilian imprisonment system – and those successfully traced will not be interviewed at all – the authors decided to divulge the preliminary results found in the present follow-up.

A total of 101 patients (77%) have been located until now. The abstinence tendency (n = 40; 39.6%) was found to be similar in relation to the second follow-up, to the detriment of crack consumption (n = 24; 23,76%). Regarding the other outcomes, two missing patients (1.98%) and four new deaths had to be computed (n = 27; 26.73%). Eight patients (7.92) are known to be in prison, which may raise such an index. Nevertheless, in the present study we were not able to locate 30 patients (29.70%). The patient situation in the three follow-up studies is listed in **Table 2**.

Of the four deaths found in the present follow-up, two (homicides) had already occurred during the second follow-up study and were not detected on that occasion. The other two deaths (homicide and overdose) occurred in 2002 and 2003, thus being considered new cases.

### *Mortality Evolution over the Follow-Up Years*

Two significant increases in the mortality rate (peak) were observed during the first follow-up (1995) and at the beginning of the second follow-up (1996-97) (**Figure 2**). After such a period, however, a decline was seen and since then the mortality rate has been stable. A new survival analysis will be carried out at the end of the data collection.

### **Discussion**

The present study is aimed at further improving the previous search methods. In order to do so, the majority of the patients/relatives were personally interviewed. In order to locate the missing patients, not only the neighborhood was consulted, but also the members of the community in which the patient lived. For example, the mother of a patient was found by consulting the local hairdresser, who used to keep a list of former clients. This delineates the importance given to the strategies used by the present study in locating missing patients. Other search instruments such as the Microsoft Messenger (MSN ®) and Orkut (Google ®) have been employed for contacting other two patients, but unfortunately they did not returned any e-mail.

In comparison to the first two follow-up studies, there was an increase in the number of not located patients ( $n = 30$ ), although the official records regarding deaths and imprisonment were not computed. It should be also emphasised that some patients had moved to other residences, cities or

even states during the follow-up interval (according to their neighbors). Up until now, 101 individuals have been located (77.1%). Harocopos *et al.* (18) have pointed out that these individuals are not likely to be found because of the long interval between follow-ups and their life profile, particularly when one considers the economically low and unstable patterns of life in which they are inserted, which usually forces them to move from one place to another.

We have observed that 63% of the patients who were found to be abstinent in the first follow-up (2 years) managed to keep such a condition (5 years). In addition, almost half of the crack users in the first follow-up stopped using such a drug in the second follow-up. This tendency is corroborated by the third follow-up study as the majority of the sample was found to be abstinent after 12 years. Also, Falck *et al.* (19) followed up 439 not-in-treatment crack users who had no criminal history and no housing problems and they found that the proportion of patients using crack cocaine more than once a day was 50% lower after 2 years of follow-up. Brain *et al.* (20), in a 6-month follow-up study, have observed an oscillation in crack use in terms of frequency and quantity. However, 25% of the sample had stopped using crack cocaine, although only 10% were not using any other psychoactive substance. In 2002 and 2003, Hser *et al.* (21) interviewed 266 veterans who had been consecutively admitted for treatment of cocaine dependence between 1988 and 1989 (12-year follow-up). The authors observed an increased index of relapse in the first two years of follow-up, which was followed by a stabilisation well below the baseline index. After 12 years, more than half of the sample (51.9%) was found to be abstinent for more than 5 years. The probability of abstinence was directly related to the number of treatment

months *per year*, thus suggesting that these drug users exhibit significant improvement and benefit from such programs when they adhere to them.

In the second follow-up, it was observed a gradual increase of the results related to bad prognosis, particularly the mortality. During this period, the mortality rate was eight-fold greater than that of the general population (SMR = 7.6). Homicides were the main cause of death, accounting for 56% of all deaths observed. In 1988, Budd (22) evaluated the first 114 deaths in Los Angeles in which the plasmatic levels of cocaine was high. The author observed that 43.8% of the cases involved homicide (n = 50), that is, 26.3% had been killed by firearm (n = 32), 15.8% by cold steel (n = 18), and 1.7% by strangulation (n = 2). Although the present study allows no suppositions to be made about the etiology and the meaning of the homicide prevalence among such patients, the high mortality rates during the five years of follow-up (1992/94 – 1998/99) coincided with the arrival of crack cocaine in São Paulo City (3, 4, 6), which resulted in extreme violence among those individuals marketing such a drug. Indeed, some studies have related the homicide rise to the expanding crack cocaine market, which recruits socially excluded youths and relies on the firearm largely available in the economically poor regions (23, 24).

The third follow-up study, however, has detected a retrocession in such a tendency. The mortality rate, which was found to be high in the first follow-up (12.6%) and significantly increased in the second follow-up, is stabilised (20.6%) according to the present study, that is, between 1999 and 2006 there were only two cases in comparison to the 25 deaths observed between 1993

and 1998. Hser *et al.* (21) have found a mortality rate of 8.7% in their 12-year follow-up study. Likewise, Murphy *et al.* (25) have carried out a long-term follow-up (11 years) of a group of 21 middle-class friends who had higher school and were sociable, and they found a similar mortality rate (8%). Both studies have pointed out that educational background, socio-economical level, and social and affective support are protective factors.

Respecting the methodological limitations cited by the authors above, some studies emphasise that, over again, socio-economical factors are involved in reducing this process: in United States, during the middle 1990's, the number of homicides among this population were significantly reduced as the socio-economical indexes and the crack cocaine market began to stabilise (24). In Brazil, the Brazilian Institute of Geography and Statistics (IBGE) reported that homicides among youth in the State of São Paulo had decreased by 43% between 2001 and 2005 (26). According to Brazilian specialists, economic improvement, campaign for disarmament (150,000 firearms had been handed over between 2004 and 2005), public security operations by the government, social activism, and accommodation on the illegal drug market were all responsible for such a fall (27).

In principle, it seems that combining adequate and effective treatment programs with public policies promoting social inclusion can be the best approach for this population.



### *Study Limitations*

As the sample served the purposes of our study, the data replication is restricted. However, the reduced duration of data collection and the change in the interview process (home visits) enabled both optimisation of the results and specific information, which yielded a multiple and more reliable mapping. In order to further understand the cessation strategies and consumption maintenance during this 12-year follow-up period after hospital discharge, we expect to carry out a qualitative investigation.

### *Acknowledges*

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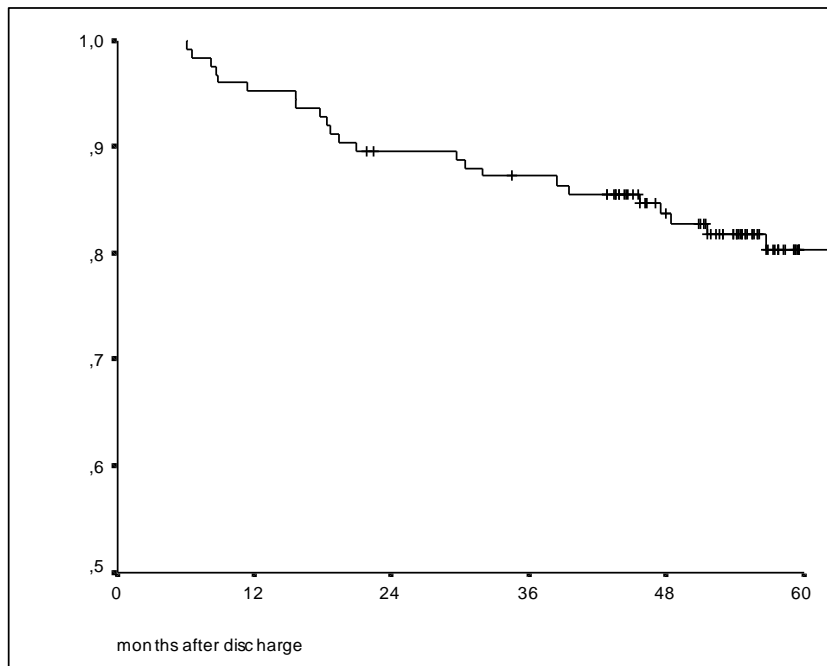
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**Table 1. Sociodemographic details of 131 crack dependent patients at the time of admission to a detoxification unit between 1992- 94.**

<b>Variables*</b>	<b>N</b>	<b>%</b>
<b>Gender: (n=131)</b>		
male	116	88.5
female	15	11.5
<b>Age [years]: (n=131)</b>		
10 – 14	3	2.3
15 – 19	35	26.7
20 – 24	48	36.6
25 – 29	20	15.3
30 – 34	12	9.2
35 – 40	8	6.1
40 – 45	5	3.8
<b>Race: (n=130)</b>		
white	97	74.6
black	33	25.4
<b>Civil status: (n=130)</b>		
single	87	66.9
married	35	26.9
divorced	8	6.2
<b>Schooling: (n=102)</b>		
less than 8 years	57	55.9
8 years or more	45	44.1
<b>Employed/studying (n =124)</b>		
Yes	38	30.6
No	86	69.4
<b>Committed an offence (n=123)</b>		
Yes	61	49.6
No	62	50.6
<b>Imprisoned (n=123)</b>		
Yes	26	21.1
No	97	78.9

\* Missing data for some variables are due to the absence of this information in the case-notes.



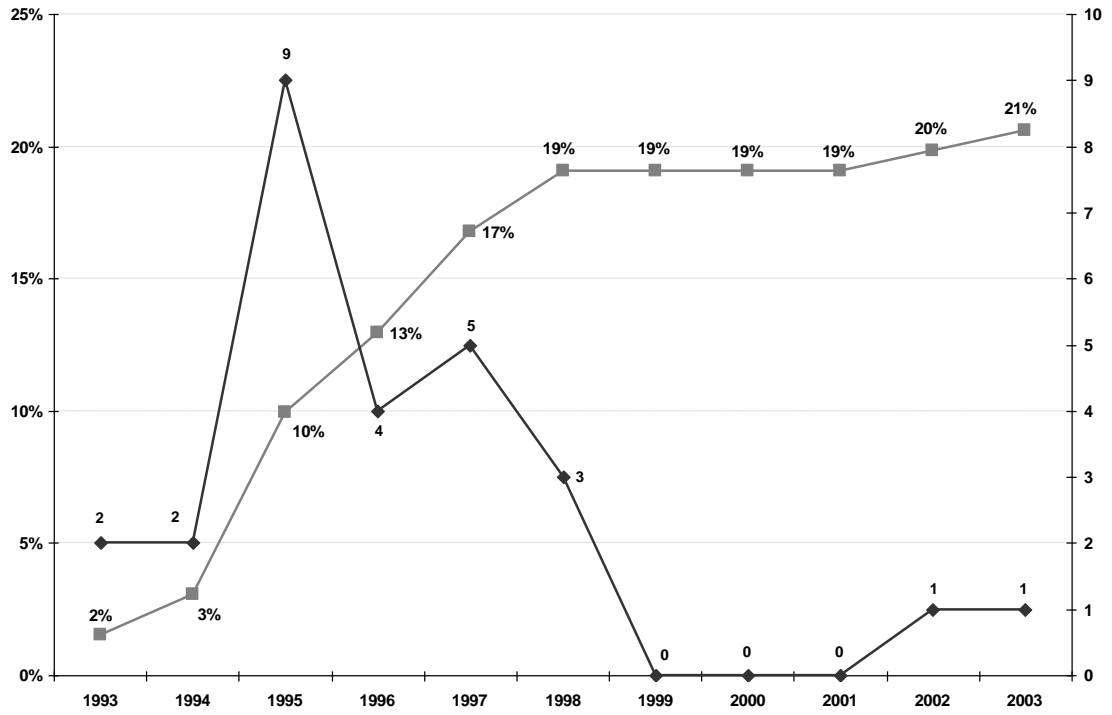
**Figure 1:** Survival curve of a sample of 126 crack dependent patients followed-up over 5 years in São Paulo, Brazil. The number of patients in risk, from the beginning of each interval was 126, 120, 111, 107, 86 and 39, respectively. The survival chance each year was 0,95 (CI 95% 0,91 – 0,99); 0,90 (CI 95% 0,84 – 0,94); 0,87 (CI 95% 0,81 – 0,93); 0,84 (CI 95% 0,77 – 0,91) and 0,80 (CI 95% 0,72 – 0,87).

**Table 2:** Situation of crack consumption among patients during follow-ups.

Follow-up	Abstinent	User	Unkown <sup>(*)</sup>	Dead
2-year	29	50	39	13
5-year	52	28	28	23
12-year	40	24	40	27

(\*) Including individuals not located at the follow-up or in prison.





**Figure 2:** Mortality evolution over 12 years. Lozenge lines show absolute death rates per year. Square lines show cumulative mortality rate evolution per year.