

## Mortality Among Opiate Abusers in Stockholm: A Longitudinal Study

Marlene Stenbacka, Anders Leifman and Anders Romelsjö

### Summary

**Background.** Earlier studies have shown that opiate abuse is associated with an increased risk of developing a negative lifestyle, and also with high mortality and morbidity in young people. Many studies on mortality among drug users are based on clinical samples with short follow-up periods. In this study we were able to follow a more general cohort of opiate abusers with reference to mortality and morbidity during a 37-year follow-up period. The aims were to analyse mortality in a large cohort of opiate abusers during a follow-up period as long as 37 years. **Material and methods:** The study is based on a cohort of opiate abusers selected in Stockholm in 1967. They were recruited by using a case finding method, with data based on reports from authorities, hospitals, prisons, schools, and so on. A total of 817 people (647 men and 170 women) reported opiate abuse alone (Op) or in combination, either with central stimulants (Op+Cs) or alcohol (Op+Alc). The cohort was followed up in the Cause of Death and Inpatient-care Registers, until 2003 and 2004, respectively. **Results.** A total of 477 (58.4%) opiate abusers (392 men and 85 women) died during the follow-up period. The average age of death was higher for the men in the cohort (48.1 years) than for the women (42.9 years). The average age at death in Stockholm County was 71.7 for men and 76.3 for women in 1967 and 77.8 and 82.3 in 2003. Irrespective of drug use (Op, Op + Cs and Op+Alcohol use), a common cause of death among the youngest (15-34 years) was accidents (41%, 35%, and 11%) followed by suicide. After adjusting to take account of age and gender in the general population in Stockholm County, the standard mortality ratio (SMR) among the whole group was 4.38 (95% CI 4.0-4.78); it was 5.79 (95%CI 4.56-7.02) for the women and 3.45(95% CI 3.11-3.79) for the men. **Conclusion.** The female addicts were at a considerably higher mortality risk than the men and at death they were younger. Accidents and suicide, especially among young people, are two causes of death which might have been prevented. This is crucial in supplying information useful to preventive efforts.

Key Words: Alcohol - Central Stimulants - Epidemiology  
- Mortality - Opiate

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## **Introduction**

There is rising concern about illicit drug use and related fatalities. Many studies have shown that substance abuse, especially the continuous or intermittent intravenous abuse of opiates is associated with higher mortality. In a study on drug abusers, Joe et al. <sup>(1)</sup> found an increased mortality among drug abusers, running as much as 14 times higher than among non-users of the same age, while Oppenheimer et al. <sup>(2)</sup> found a mortality rate of 1.8% per year, and an excess mortality ratio of 11.9. Darke, Ross & Hall <sup>(3)</sup> reported a rate of 2% to 3% of heroin users who died each year; the mortality rates recorded were 20 times higher than those of non-users in the same age group. Studies on maintenance treatment for opiate abusers have shown that the mortality rate rises during the period following the moment when the patient leaves treatment, compared with opiate abusers who stay in treatment <sup>(4-5)</sup>.

Increased mortality is found in those who abuse opiates, especially young people. Studies have found that death due to drug abuse was relatively higher among people aged less than 45 years than among those 45 (OR=6.3, 95% CI 5.0-8.0) <sup>(6)</sup>.

In a 15-year follow-up study on 188 people (122 men and 66 women) with a history of intravenous opiate abuse in Denmark, it was shown that 32% had died during the entire follow-up period. Those opiate abusers who had achieved stable abstinence from intravenous drug use were at lower risk of premature death than people who continued to use drugs. Socially disadvantaged persons were more likely to develop alcohol and drug abuse. In a 50-year follow-up study of about 500 delinquent and 500 non-delinquent boys aged between 14 and 65, Laub & Vaillant <sup>(7)</sup> found that unnatural deaths were higher among the delinquent boys: 14% vs. 6%. In a 33-year follow-up study of 581 male heroin addicts participating in the California Civil Addict Program (CAP) between 1962 and 1964, nearly one third died during the follow-up period <sup>(8)</sup>. The most common cause of death was accidental poisoning or drug abuse (21%), chronic liver disease (15%) and cancer (11%). Nearly 20 percent of the deceased had died because of homicide, suicide or an accident.

Many studies on mortality among drug abusers have focused on heroin or opiate abusers in clinical settings. Few studies, on the other hand, have focused on a more general cohort of opiate abusers. In this study we were able to study the mortality and morbidity of a cohort of opiate abusers over a 37-year follow-up period.

## **Aims**

The study's aims were to analyse mortality and causes of death in a large cohort of male and female opiate abusers over a 37-year-long follow-up period.

## **Material and Methods**

A National Drug Dependence Committee organized the first case-finding study on drug users in Sweden in 1967. This was carried out in the Stockholm Council<sup>(9-10)</sup>. The reporting sources were hospitals, prisons, the social welfare committee, psychiatric hospitals and units and other hospitals, penal services, police and the temperance committee, schools, an injection mark survey team at a prison in Stockholm, and others. Altogether, 1,949 cases involving drug use were identified, 98% of them were Swedish citizens; 1,616 people in this cohort were intravenous drug users.

In this study, we included 1,705 drug users (1,288 men and 417 women) who had no missing data on personal identifications or other important variables. Eight hundred and seventeen (647 men and 170 women) had opiates as their dominant (main) drug. We studied those who used opiates only, those who also used central stimulants (Op+CS), and those who also used alcohol (Op+Alc).

Three hundred and seventy-four (287 men and 87 women) had only used opiates (Op). Four hundred and forty-three (360 men and 83 women) had used both opiates and central stimulants (Op+Cs) and 89 persons had used opiates and alcohol (Op+Alc). A total of 477 had died during the follow-up period.

### ***Follow-up***

The cohort was followed with reference to mortality and causes of death from the year, 1967, of their identification in the Case-finding survey, either up to December 2003, or to their date of death. Permission to link data on the cause of death to the study cohort was given by Karolinska Ethical Committee.

All cases were linked to the national Cause of Death Register to determine the date and cause of death, via the national registration number. The Cause of Death Register in Sweden covers all death cases throughout Sweden. This register is based on death certificates. Deaths were classified in different groups in the way adopting by the "Classification of Causes of Death in Swedish Statistics", which is compiled from the International Classification of Diseases, Injuries, and Causes of Death (ICD). ICD-8 was used for 1967-1986, ICD-9 was used for 1987-1996 and ICD-10 was used for 1997 onward. Each certificate shows one underlying cause of death, but contributing causes can be mentioned too. For patients who die in hospital, the death certificate is filled by the physician in charge, and for deaths not occurring in hospital, the physician in charge of the patient certifies the cause of death. When the cause of death is unclear, an autopsy is performed. In undetermined deaths, there is always a forensic autopsy. If an autopsy is performed, the death certificate is considered preliminary until the information provided by an autopsy is included too. In the period 1973-1995, the frequency of an autopsy for natural causes of death was 86% in people aged between 15 and 49, 68% in people aged between 50 and 69, and 45% in people aged 70 or more, but the autopsy frequency then declined. For unnatural causes of death, the autopsy frequency was 90% in people aged between 15 and 49, 88% in people aged between 50 and 69, and 53% in people aged 70 and more. The Cause of Death Register covers more than

99% of all deaths occurring in Sweden <sup>(11)</sup>.

**Statistical analyses**

The Standard Mortality Ratio (SMR) was calculated as the observed number of deaths divided by the expected number of deaths, with 95% confidence intervals. The cohort was standardized according to age and gender.

**Results**

A total of 477 people who, according to the information made available at the case-finding, had used opiates alone (170 men and 40 women) or Op+Cs (220 men and 45 men) or Op+ alc (56, 47 men and 9 women) died during the follow-up period. Of these 477 death cases, 85 (18%) were women.

Nearly all those who were opiate users only (96%), 98% of those who had used both Op+Cs and 99% of Op+Alc users had used opiates intravenously.

Table 1 shows age distribution at baseline and age at death subdivided into the

Table 1. Age at baseline and at the time of death among 817 opiate abusers (647 men and 170 women). Follow-up 1967-2004			
	Men	Women	Total
<b>Age at baseline</b>	Mean (Min - Max)	Mean (Min - Max)	Mean (Min - Max)
Opiate (N=374) (287 M and 87 F)	26.7 (15-47)	22.1 (14-41)	25.6 (14-47)
Opiate+CS (N=443) (360 M and 83 F)	26.5 (14-46)	24.7 (15-42)	27.2 (14-46)
Opiate + Alc* (N=89) (79 M and 10 F)	27.2 (15-46)	25.4 (16-40)	27.0 (15-46)
Total			
<b>Age at death</b>			
Opiate (N=210) (170 M and 40 F)	49.0 (16-76)	41.7 (18-62)	47.6 (16-76)
Opiate+CS (N=267) (222 M and 45 F)	47.5 (21-74)	44.0 (19-77)	49.9 (19-77)
Opiate + Alc* (N=56) (47 M and 9 F)	47.7 (26-72)	44.9 (29-65)	47.2 (26-72)
Total	48.1 (16-76)	42.9 (18-77)	47.2 (16-77)
*89 persons used Op+Alc. This group is a part of the other two groups (Op or Op+Cs)			

three opiate use categories: Op use alone, Op + Cs and Op+Alc. The female users were younger in terms of initial use; this was especially true of those who had used opiates alone: 26.7 years for men and 22.1 years for women. Considering all three categories together, the age at death was about 47-49 years. Especially among opiate users, the women were younger at death than the men: 41.7 vs. 49 years.

An analysis of inpatient care stays during the follow-up period showed that over half of the men (52.7%), and over half the women, too (51.2%), had either been treated for an alcohol- or a drug abuse-related diagnosis at hospital during the follow-up period.

### ***Causes of Death***

A high number of opiate abusers in all three categories (59%) had died during the follow-up period, 1967 to 2003. We found that nearly one third in each of the three categories had died of an alcohol-related diagnosis and nearly one fifth had a drug-related main or secondary diagnosis. Nearly 40% of the female and 30% of the male opiate users had died with an alcohol-related diagnosis (i.e. with alcohol use as the primary or as a contributory cause of death).

When analysing primary causes of death it was found that, independently of drug use, the most common cause of death was accidents (n=71), a category that mostly comprised transport accidents (n=21.3, 6%), homicides (n=16, 22.5%) and injuries from falls (n=10, 1.1%). Nearly 17% (80 out of 477) had died of circulatory diseases; of these deaths, most were due to myocardial infarction (n=31,38%) or to diseases in the vessels of the brain (n=24, 30%).

Sixty people (12,6%) had died because of a malignant tumour. Of these, 19 (31.7%) had died because of liver cancer and four (6.7%) from lung cancer. Nearly 6 % (n=28) had died with an alcohol-related diagnosis (alcohol dependence [n=17] or alcohol intoxication [n=7], while three people had alcohol psychosis as their primary diagnosis). Thirty-eight people (8.0%) had died with drug-related diagnoses (narcomania [n=24] or drug intoxication [n=12] and two people died of drug dependence).

Forty-nine people had committed suicide (24 persons from intoxication, and 11 others from smothering). Thirty-one people had died in a situation of unclear suicide. Of these, a majority, 21 (67.8%) had died of intoxication. A total of 64 (13%) people had died of intoxication.

Table 2 shows the causes of deaths for men and women. The most common cause of death for women was circulatory diseases (15.3%) followed by suicide (12.9%) accidents (11.8%) and liver cirrhoses (11.8%). The most common causes of death among men were circulatory diseases (17.1%), accidents (16.1%), tumours (13.0%) and liver cirrhoses (10.7%). Death due to an accident was more common among men (16.1%) than women (11.8%), while suicide was more common among women (12.9%) than men (9.7%).

Figure 1 shows the causes of death among all opiate abusers. The most common causes were circulatory diseases (17%) and unclear and clear cases, considered together, of suicide (n=17%) and accidents (n=15%). Cirrhoses, too, were a rather common cause of death (11%).

Table 2. Causes of death among 477 death cases identified as opiate users in 1967. Follow-up 1967-2003

	Men (N=392)	Women (N=85)
	N (%)	N (%)
Alcohol-related diagnoses	21 (5.4)	7 (8.2)
Drug-related diagnoses	30 (7.1)	8 (8.2)
Infection	7 (1.8)	-
Liver cirrhoses	42 (10.7)	10 (11.8)
Digestive diseases	12 (3.1)	2 (2.4)
Circulatory diseases	67 (17.1)	13 (15.3)
Unclear suicides	25 (6.4)	6 (7.1)
Suicide	38 (9.7)	11 (12.9)
Accidents	61 (16.1)	10 (11.8)
Tumors	51 (13.0)	9 (10.6)
Others	38 (9.7)	9 (10.6)

The standard mortality ratio (SMR) was calculated for mortality, standardized both for age and gender to the general population in Stockholm county. The total cohort of opiate users (n=817) had a SMR = 4.38 (95%CI (3.99-4.78)). The women ran a greater mortality risk than the men: SMR=5.79(95% CI, 4.56-7.02) and 3.45 ( 95%CI 3.11-3.79) respectively.

## **Discussion**

The aim of the present study was to analyse mortality and causes of death among three different categories of opiate users in 1967: opiate abuse only, abuse of opiates and central stimulants and abuse of opiates and alcohol. One limitation is that we do not know how many of those who were opiate abusers in 1967 stopped that use, or switched to other drugs or alcohol. It is likely that some of the abusers stopped their use. This means that the SMR would have been higher if the calculations had only included those who continued their abuse.

Nearly a quarter of the cohort were women (24.7%) and most of those in the cohort (both men and women) had reported intravenous opiate abuse.

A high percentage (59%) of the whole cohort died during the long follow-up period. The female opiate users ran a greater mortality risk than the men, and were younger at the time of death. Predictably, during this long period, lasting 37 years, natural causes of death became more common.

Another explanation for the high mortality in this cohort could be the limited number of places included in the Swedish methadone programme <sup>(12)</sup>. In order to forestall

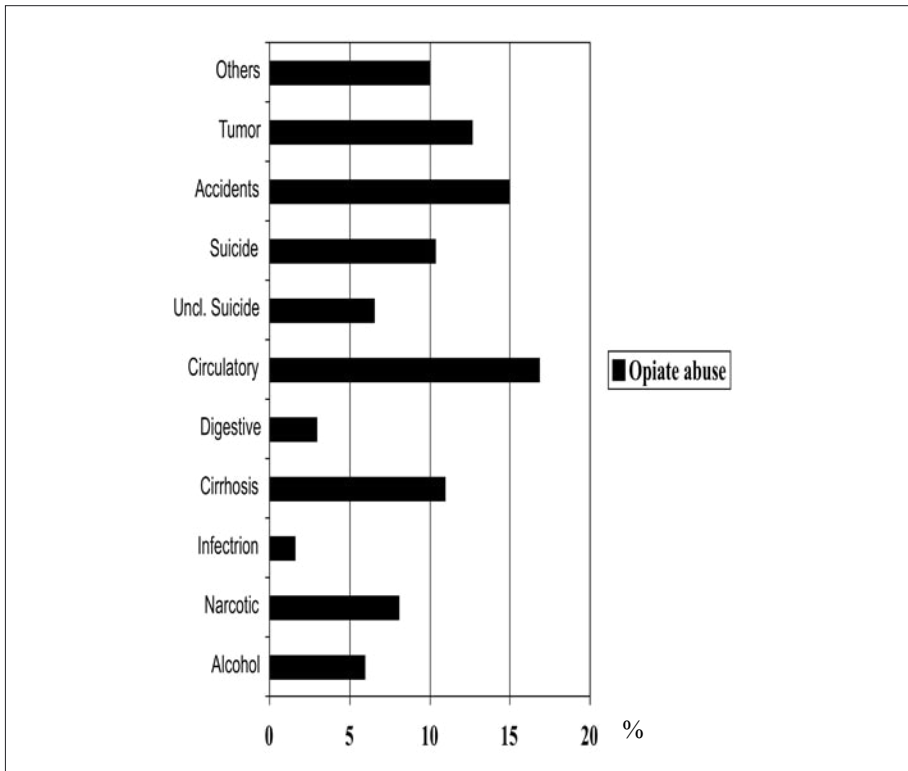


Figure 1. Causes of death among 477 dead persons with opiates as dominant drug in 1967. Follow-up 1967-2003. Percentage.

any possibility of an HIV-epidemic among intravenous drug abusers, and especially among intravenous opiate abusers, the Swedish National Board of Health and Welfare decided to increase the number of patients. The Stockholm Methadone programme was approved in 1988. This programme increased the number of patients from 100 in 1988, to 271 in 1994 and 310 in 2000; currently there are about 1000 opiate abusers in maintenance treatment in Stockholm County. The numbers of maintenance programmes have increased and there are now about 2600 opiate abusers in maintenance treatment in the whole of Sweden.

Other longitudinal studies have reported varied mortality during follow-up periods.

Hser et al. found that nearly 50% of the nearly 600 drug abusers had died during a 33-year follow-up period<sup>(8)</sup>, while Nehkant et al.<sup>(13)</sup> found that 22% had died in a cohort of 86 heroin-dependent persons during a 33-year follow-up. Termorshuizen et al.<sup>(14)</sup> found, among low-threshold maintenance patients (n=899), that 27% had died between 1985 and 2002.

The female opiate users died younger (at about 43) than their male counterparts

(at 48 years). It may be that the women opiate users constituted a still more negatively selected group than the men in the cohort. Suicide and accidents were the most common causes of death in the lowest age group (15-34 years). A similar pattern was found in a 20-year follow-up study on 9,491 teenage addicts, which inquired into mortality in the United Kingdom, where it was found that, of 301 deaths, 68.6% were due to an overdose or accidental poisoning <sup>(15)</sup>. The most common causes of death in the whole cohort were cirrroses and circulatory diseases, accidents and suicide (unclear and clear considered together) and tumour diseases.

For the group taken as a whole, alcohol was often a main or contributory (about 30%) cause of death in both men and women. Liver cirrhosis, too, was a common cause of death. That liver cirrhosis may have been caused by alcohol abuse and/or hepatitis C infection.

The causes of death among men and women showed a strong degree of similarity. However, death due to an accident was more common among men than among women: 16.1% and 11.8%, respectively.

## **Conclusion**

Overall, the mortality in this cohort, which was adjusted for sex and age to bring the figures into line with those for the normal population in Stockholm County, was about three times higher for opiate abusers than for the general population, six times higher for Op+Cs abusers and 27 times higher for Op+Alc abusers. The female addicts were at a considerably higher mortality risk than the men, and they were also younger at death — a situation which is the opposite of that in the normal population. Suicide and accidents, especially among the youngest age group, are two causes of death which could have been prevented. This knowledge could prove crucial to prevention efforts directed against opiate abuse in society.

## **Acknowledgement**

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## **References**

1. Joe G.W., Lehman W., Simpson D.D.(1982): Addict death rates during a four-year posttreatment follow-up. *Am J Publ Health* 72:(7): 703-709.
2. Oppenheimer E., Tobult C., Taylor C., Andrew T.(1994): Death and survival in a cohort of heroin addicts from London clinics: a 22-year follow-up study. *Addiction* 89:10:1299-1308.
3. Darke S., Ross J., Hall W. (1996): Overdose among heroin users in Sydney, Australia: II. Responses to overdose. *Addiction* 91 (3), 413-417.

4. Stenbacka M., Leifman A., Romelsjö R., (1998): The impact of methadone consumption on inpatient care and mortality, with special reference to HIV status. *Subst Use Misuse* 33:2819-34.
5. Fugelstad A., Stenbacka M., Leifman A., Nylander M., Thiblin I. (2007): Methadone maintenance treatment: The balance between life-saving treatment – life-saving or fatal. *Addiction* 102:406-412.
6. Ghodse H., Oyefeso A., Kilpatrick B. (1998): Mortality of drug addicts in the United Kingdom 1967-1993. *Int J Epidemiol* 27:473-478.
7. Laub J.H., Vaillant G.E. (2000): Delinquency and mortality: A 50-year follow-up study of 1,000 delinquent and nondelinquent boys. *Am J Psychiatry* 157:1, January 2000.
8. Hser Y-I., Hoffman V., Grella C.E., Anglin M.D. (2001): A 33-year follow-up of narcotics addicts. *Arch Gen Psychiatry* vol. 58 503-508.
9. Frej G. (1969): Case-finding survey: angående narkotikamisbrukare kända av olika myndigheter i Stor-Stockholm under tiden 1 juli-31 december 1967. In *SOU* 1969:53,194-217.
10. Bejerot N. (1975): Drug abuse and drug policy. An epidemiological and methodological study of drug abuse of intravenous type in the Stockholm arrest population, 1965-1970, in relation to changes in drug policy. *Acta Psychiatr Scand Suppl* 256.
11. Statistics Sweden [federal agency for national statistics], (1998).
12. Gronbladh L., Ohlund L.S., Gunne L.M. (1990): Mortality in heroin addiction: impact of methadone treatment. *Acta Psychiatr Scand* 82:223-7.
13. Nehkant H., Rathod W., Addenbrooke M. Rosenbach A.F. (2005): Heroin dependence in an English town: 33-year follow-up. *Br J Psychiatr* 187:421-25.
14. Termorshuizen F., Krolk A., Prins M., van Ameijden E.J.C. (2005): Long-term outcome of chronic drug use. The Amsterdam cohort study among drug users. *Am J Epidemiol* 161:271-279.
15. Oyefeso A., Ghodse H., Clancy C. (1999): Drug abuse-related mortality: a study a teenage addicts over a 20-year period. *Soc Psychiatry Epidemiol* 34:437-441.

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# S P E C I A L CHIMERA AWARD

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Pietrasanta, Italy  
September, 27 - 2007

**Joyce Lowinson**  
(New York, NY, USA)

Joyce Lowinson, MD fulfilled a lifelong dream and became the fourth woman to graduate from the Albert Einstein College of Medicine in the Bronx in 1958. Shortly afterward, she completed her residency in psychiatry. She became involved with the methadone maintenance research work of Drs. Marie Nyswander and Vincent Dole at Rockefeller University as their successful project was just progressing and expanding to provide treatment to a greater numbers of patients. Thus, she began her lifelong career as a clinician, teacher and author working to help people dependent on drugs. She also began her lifelong friendship with Marie Nyswander and Vincent Dole. She was one of the bridesmaids at their wedding and worked collaboratively with them throughout her long career. As their research with methadone expanded into critically needed treatment, Dr. Lowinson opened one of the first MMTP clinics at Beth Israel Medical Center, on 112th Street, near both St. Luke's Hospital and Columbia University.

Always concerned about those not yet in treatment, and the growing waiting lists for methadone treatment in New York City, Dr. Lowinson helped form a Citizen's Committee to Expand Methadone Treatment, enlisting notable New Yorkers to help secure funding to eliminate the list. She recruited Dr. Beatrice Berle, a friend and colleague to appeal to Governor Nelson Rockefeller for needed funding to open new clinics and end the waiting lists. This effort resulted in ten million dollars to develop programs at Beth Israel Medical Center (in Manhattan, Brooklyn, Queens and Staten Island) and Albert Einstein College of Medicine (in the Bronx). She then returned to Einstein to direct their expansion programming, while working with physicians, federal and state officials and others to expand treatment opportunities for those dependent on heroin. Through her efforts, Einstein became the largest program operated by a medical school in the nation providing care to over 3500 patients.

During her career, she chaired several national conferences about the problems of substance abuse. In recent years, she has initiated and chaired 7 conferences on Pain and Chemical Dependency, bringing together clinicians and researchers in both fields. She has published over 75 articles and several book chapters about the efficacy of methadone maintenance treatment and is the editor of the well respected and often cited Comprehensive Textbook on Substance Abuse, the premier volume of its kind. The third edition of this best selling book was published 18 months ago and a 4th edition is in the planning stages.

Dr. Lowinson has always been a tireless advocate for methadone treatment, for patient rights and most recently, for the adequate treatment of pain, particularly for those with both chemical dependency problems and chronic pain. In addition to her clinical work at the Einstein program, Dr. Lowinson maintained a private practice in addiction and psychiatry focused on the treatment of addicted physicians. She continues to practice to this day and serves as a consultant on addiction in the medical profession to the State of New York.