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[French monitoring centre for drugs and drug addiction]

Review of the latest research

Mortality of individuals arrested for heroin, cocaine or crack use

Although an essential indicator of public health, mortality due to illicit drugs is not well documented in France. The existing statistical systems provide details, with varying amounts of information missing, on deaths from overdose and AIDS of users who inject. This information covers only some of the causes of death and does not allow the high mortality of drug users to be calculated. This remains an assumed figure based on the information available on the dangerousness of the various substances and the results of studies carried out abroad.

Measuring mortality requires that it is possible to relate the number of deaths recorded over a given period to a population exposed to a risk factor. In short, rigorous estimating of mortality assumes the setting up and prospective monitoring of a cohort of active users of illicit drugs. This solution, which is complex to implement and very expensive, has to date not been adopted in France.

To compensate for this deficiency, the OFDT has drawn up a draft retrospective study of a cohort, which has produced an estimate of the high mortality in users of illicit drugs based on the deaths that have occurred among individuals arrested at the beginning and in middle of the 1990s for drug use or for drug use and trafficking. This study¹ received the approval of the CNIL [*Commission Nationale de l'Informatique et des Libertés* – National commission for computing and liberties] in June 2002.

Sources and methods

The body of information available for the analysis comes from data linkage of three different statistical registers, in the context of a procedure which guarantees anonymity and is managed by the INSERM (*Institut national de la santé et de la recherche médicale* [National institute for health and medical research]). The arrest data, which came from the *fichier national des infractions à la législation sur les stupéfiants* [File of police questioning for the use of narcotics] (FNAILS) held by the OCRTIS², was compared, initially, to the

¹ The complete report will be available on the OFDT website in July 2004.

² *Office central pour la répression du trafic illicite des stupéfiants* – Central office for the repression of drug-related offences.

Répertoire national d'identification des personnes physiques [National register of persons] (RNIPP) administered by the INSEE (*Institut national de la statistique et des études économiques* [National institute for statistics and economic studies]), in order to find out the vital status (in 2002) of the individuals arrested. For the list of deaths thus generated, a search was then carried out in the register of medical causes of death produced by the CépiDc-INSERM [*Centre d'épidémiologie sur les causes médicales de décès* – Epidemiology centre on the medical causes of death - INSERM].

For cost reasons, the number of people recorded in the FNAILS who were included in the study was limited to 50,000. These were deliberately divided into two groups of approximately equal size: individuals arrested for heroin/cocaine/crack use or use and trafficking, and individuals arrested for cannabis use or use and trafficking. After file validation and data linkage, it was possible to determine the vital status for around 42,500 individuals born in France and arrested in 1992, 1993, 1996 or 1997³. A group of individuals arrested for ecstasy use was created. But, on account of the low numbers involved, an in-depth analysis of the mortality could not be carried out on this group.

Owing to significant biases in the results of the “cannabis group” (see discussion), only the analyses involving the individuals arrested for heroin, cocaine or crack use are developed in this article.

Results

The cohort of individuals arrested for heroin/cocaine/crack use comprises around 23,000 individuals, 82% of whom are male, aged 27 on average. A little over 70% are unemployed or with no stated occupation. They are more numerous in the regions situated in the north and north-east of France and in the Mediterranean perimeter. A majority of the individuals in this group (52%) have been arrested more than once.

At the end of the file-matching process, a list was generated of 1016 deaths, between 1992 and 2001, of people included in this cohort. Among these deaths, 609 causes (coded in the ICD9⁴) were documented. At the time of the matching process between the various databases (in 2002), the INSERM was not in a position to provide information on the deaths which occurred after 1999 (namely 407 deaths).

The deaths of the individuals arrested for heroin/cocaine/crack use for whom the causes of death are known can be divided up as follows: 20% are deaths from overdose directly linked to drug use, 13% are deaths from AIDS, a little over a third are deaths from external causes of traumatism and poisoning (including 10% from road accidents and 11% from suicide) and one fifth are deaths where the cause is unknown. The remaining 15% comprise deaths from tumours and diseases of the circulatory, respiratory and digestive systems.

³ The FNAILS has stated names since 1990 but recording problems reported by the OCRTIS have led to the years 1990 and 1991 being excluded. At the time the study was launched, the Interior Ministry authorised exploitation of FNAILS data only from 1996 onwards for arrests for drug use and with no date limit for arrests for drug use and trafficking.

⁴ Ninth version of the International Classification of Diseases.

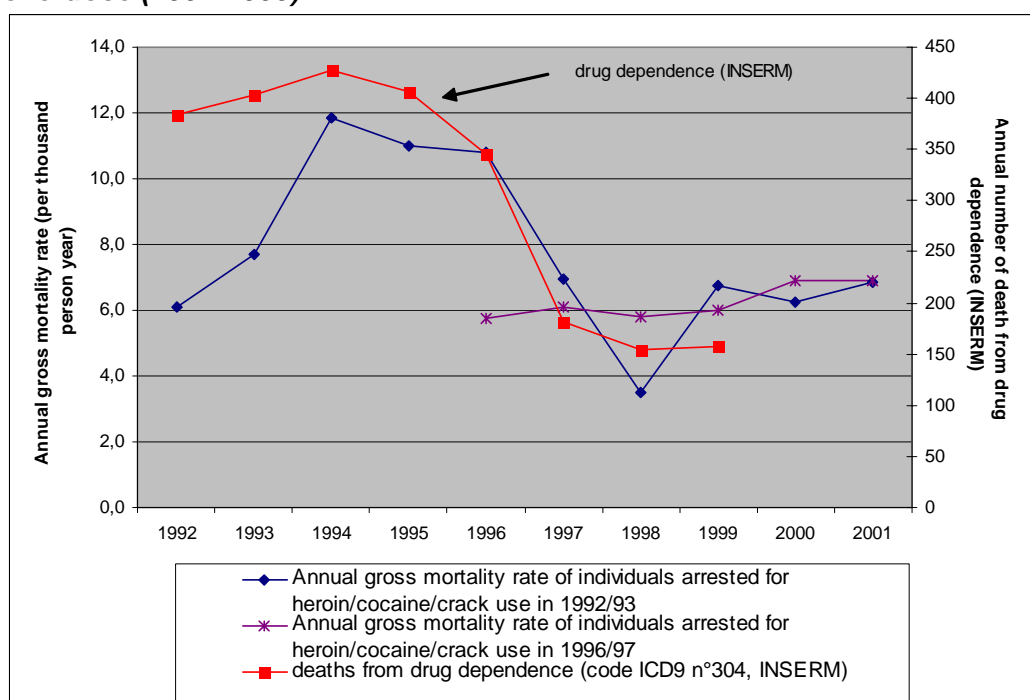
A falling mortality

Across the entire observation period, the gross mortality rate works out at 7.3 deaths per thousand person-years⁵ (PY). The mortality rates among the individuals arrested increase, logically, with the age at the time of the arrest (3.8 per thousand PY for the under-25s versus 17.9 among the 45-59 year-olds; $p = 0.001$) and are higher in men than in women (7.7 per thousand PY versus 5.3; $p = 0.01$).

The gross mortality rates experienced a strong downward trend during the observation period. Calculated over the four years following the arrest, the mortality rates of the individuals arrested for heroin/cocaine/crack use in 1996/1997 are nearly half those of the individuals arrested in 1992/1993 (on average, 6.2 per 1000 PY versus 10.3 per 1000 PY; $p = 0.01$).

As is shown in graph 1, this reduction is accompanied by an epidemic phenomenon for the years 1992 to 1997, the peak being reached in 1994 with a mortality rate close to 12 per 1000 PY. This trend is similar to that observed for the number of deaths from overdose. At the end of the 1990s and at the beginning of the 2000s, the mortality of this group seems to have stabilised⁶, whatever the date of inclusion in the cohort, around a rate of 6 to 7 per 1000 PY.

Graph 1 – Annual gross mortality rate (1992-2001) and number of deaths from overdose (1992-1999)



Reading: two-axis graph putting into perspective the annual mortality rates in the cohort of individuals arrested for heroin/cocaine/crack use (left-hand axis) and one of the main indicators of mortality in drug users (on the right – death from drug dependence)

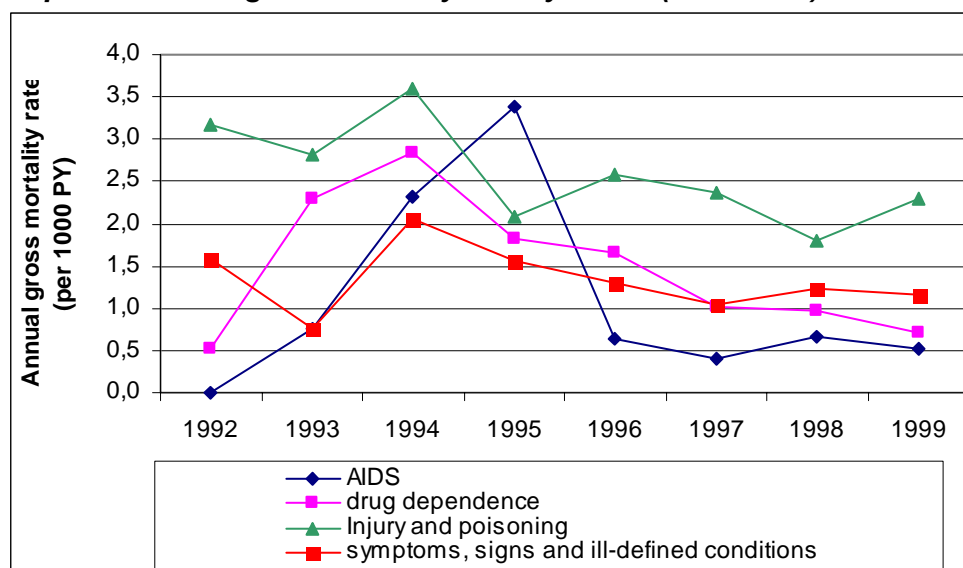
Sources: cohort of individuals arrested for drug use, OFDT (OCRTIS, INSEE and INSERM data); national file on causes of death (CépiDc-INSERM).

⁵ The mortality rates are calculated in person-years, a calculation generally adopted in the context of cohort studies. For further details, please see “Definitions”.

⁶ The annual gross rates are calculated on low numbers; the small-scale variations such as between 1999 and 2000 for those arrested in 1996/1997 are not statistically significant.

The data on the causes of death adds further explanations. This downward trend in mortality is in fact linked primarily to the fall in the gross mortality rates from AIDS and overdose, divided by 6 and 4 respectively between the middle and the end of the 1990s. For deaths from traumatic injuries and poisoning, the rates, which fluctuate more, are also on a downward trend but more modestly so (a drop of between 50% for suicides and around 100% for road accidents and other accidents). Mortality classified under unknown causes, part of which may be deaths from overdose, is also falling.

Graph 2 – Annual gross mortality rate by cause (1992-1999)



Source: cohort of individuals arrested for drug use, OFDT (OCRTIS, INSEE and INSERM data)

A widespread high mortality

In order to be able to compare the mortality of the cohort to that of the French population as a whole, it is necessary to take into account the differences in age and gender. In fact, the individuals in the cohort are on average much younger than the French population as a whole and the vast majority are male. The standardised mortality ratio (SMR) enables comparisons of mortality using an identical age and gender structure⁵.

For the same age, the men arrested for heroin/cocaine/crack use have a risk of dying which is 5 times higher than the national male average; for the women arrested, the risk ratio compared with the French female population is greater than 9.

A higher SMR for women does not mean that the mortality of women is higher than that of men. It indicates that the difference observed between the mortality of the women included in the cohort and the average one of French women is greater than for men. In other words, the risk of dying among the women arrested for heroin/cocaine/crack use is far higher than that among French women (9 times as much risk), this difference being less in the men (5 times as much).

Table 1: SMR according to the product involved in the arrest (1992-2001)

Substance	Men ⁽¹⁾	Women ⁽¹⁾
	SMR	SMR
Individuals arrested for heroin/cocaine/crack use	5.19***	9.52***
Heroin	5.27***	9.74***
Cocaine	4.31***	8.50***
Crack	4.50***	5.39
French population as a whole	1.0	1.0

(1) Reference year: 1997 for the gross mortality rates of the general French population, and taking into account solely people aged between 15 and 59

*** = p<0.001; ** = p<0.01; * = p<0.05

Reading: the men arrested for heroin/cocaine/crack use have a risk of dying which is 5.19 times higher than men of the same age in the French population. This risk is statistically significant and is calculated with a confidence interval at 95%.

Source: cohort of individuals arrested for drug use, OFDT (OCRTIS, INSEE and INSERM data)

A high mortality appears for all the causes being considered (except for diseases of the nervous system and the sens organs) among the individuals included in the cohort. The high mortality is, not surprisingly, very high for AIDS and overdoses (SMRs, respectively, of 24 and more than 100 in men, and 29 and more than 600 in women). It is lower but still in the ratio of three to five for road accidents, suicides, and diseases of the circulatory, respiratory and digestive systems, in men. The factor is 5.4 for road accidents and 12.6 for suicides in women. The mortality from overdose and AIDS does not therefore account for the entire mortality of the individuals in the cohort who thus appear, overall, more vulnerable than the French population as a whole.

Table 2: SMR by cause and gender (1992-1999)

Causes	Men ⁽¹⁾	Women ⁽¹⁾
	SMR	SMR
Infectious and parasitic diseases	22.0***	23.2***
<i>including recognised AIDS and HIV infection</i>	24.0***	28.7***
Neoplasms	2.3**	3.2*
Mental disorders problems	42.6***	139.9***
<i>including drug dependence</i>	102.7***	677.4***
Diseases of the nervous system and sensory organs	1.5	-
Diseases of the circulatory system	3.5***	12.9***
Diseases of the respiratory system	5.1**	5.9
Diseases of the digestive system	4.9***	14.5**
External causes of traumatism and poisoning	4.1***	10.2***
<i>including road accidents</i>	3.1***	5.4**
<i>accidental poisoning by drugs</i>	26.2***	-
<i>other accidents and after-effects</i>	10.0***	22.7**
<i>Suicides and self-inflicted injury</i>	3.5***	12.6***
<i>homicide</i>	10.7***	-
Symptoms signs and ill-defined conditions	12.0***	34.9***
All deaths ⁽²⁾	6.3***	13.3***

(1) Reference year: 1997 for the gross mortality rates of men in the general French population, and taking into account solely people aged between 15 and 54

*** = p<0.001; ** = p<0.01; * = p<0.05

(2) The data in this line is calculated for the period 1992-1999 since the causes of death are not available beyond 1999. This explains the difference compared with the figures in table 1, which are calculated over the period 1992-2001.

Reading: the men arrested for heroin/cocaine/crack use have a risk of dying from "infectious and parasitic diseases" which is 22.0 times higher than men of the same age in the French population. This risk is statistically significant and is calculated with a confidence interval at 95%.

Source: cohort of individuals arrested for drug use, OFDT (OCRTIS, INSEE and INSERM data)

Discussion

This study is based on the use of data from arrests for drug use or drug use and trafficking. The merit of this approach is that the study is able to include, at a lower cost, a population which is much more numerous than in the prospective studies. It does however have a number of limitations.

“Hidden” use and misunderstood methods of use

The objective of this study was to try to improve knowledge on the mortality of drug users and not only of individuals arrested for drug use. However, these two notions are not identical. A person who is arrested, even if he or she has been found in possession of a certain quantity of an illicit substance, may not use this product or may use another product without ever being arrested for its use. Among the individuals arrested for heroin/cocaine/crack use, any cannabis use will not, on average, alter the risk of death. By contrast, among the individuals arrested for cannabis use, the existence of “hidden” opiate use alters this risk very considerably. In the cannabis cohort, several deaths from overdose have been listed. Since deaths from cannabis overdose are not medically documented, it is highly probable that these involve heroin or opiate users. The existence of a non-evaluable number of users of higher-risk substances among those arrested for cannabis use heavily biases the mortality calculations in this cohort. It is therefore not possible to measure the mortality of cannabis users based on a study of the individuals arrested for use of this substance.

Another significant limitation of this study is the absence of information on the drug-use practices of the individuals arrested even though the mortality risk among drug users is highly dependent on the frequency and method of administration the substances.

One might also question whether the arrest does not in itself constitute a form of selection of a population at a higher risk of death (Barré M-D, 2000), even in the absence of drug use.

Finally, it must be mentioned that matching against the RNIPP is not possible for people born abroad (around 14% of those arrested), and that the cross-checking failed in 11% of cases (false names, errors concerning the date of birth).

A lower mortality than in the foreign studies

Numerous mortality studies based on prospective cohorts were carried out abroad during the 1990s. These all have in common the fact that they are based on the inclusion of opiate users who, most of the time, are seen within the care structures. The different estimates of the annual mortality rate of opiate users vary, according to Warner-Smith, M. *et al.* (2001) and in the majority of the cohort studies coordinated by the European monitoring centre for drugs and drug addiction (EMCDDA, 2002), from 10 to 30 per 1000 PY. These rates appear much higher than those calculated in this study (7.3 per thousand PY on average with a maximum of 12 per thousand PY in 1994). Likewise, the SMRs calculated solely for those arrested for heroin use remain lower than those that may be recorded by Warner-Smith, M., *et al.* (2001) or by Bargagli, A. M., *et al.* (2001) among active users or users undergoing treatment.

The lower mortality in the French cohort may be explained firstly by the recruitment within the care structures in the foreign studies, which probably results in the selection of a more homogeneous population of users presenting higher risk levels.

Secondly, the geographical sphere of the study may also strongly influence the results. In the foreign studies, it is generally limited to a large city, often the capital. It seems probable that the populations which are the most problematic and the most exposed to the risks of death are concentrated in the large cities. In the French study, the gross mortality rate in the Ile-de-France region is higher than the national level (11.0 per thousand PY versus 7.3; $p = 0.001$), with an annual maximum (25 per thousand PY) situated at the top of the range of rates listed in the various foreign studies.

Thirdly, attention must be paid to the beginning and end dates of the monitoring. In the French study, the period 1992-2001 made it possible to incorporate the effects on mortality of the therapeutic advances for AIDS-sufferers (introduction of tritherapies in 1996). In several foreign studies, the results were provided on a date which did not allow these effects to be taken into account, or at least not so fully.

Factors linked to the public policies followed in the various countries may also play a part, particularly as far as availability of substitution treatments and risk-reduction measures are concerned.

Conclusion

This study, focusing on individuals arrested for heroin/cocaine/crack use, provides an approximate measure of the mortality of heroin/cocaine/crack users but with a underestimation bias due to the possible presence of non-users and occasional or recreational users among those arrested. The risk of death is much higher among the individuals included in the study than that in the population as a whole (5 times higher in men and 9 times higher in women). This high mortality can be observed for all the causes of death, which testifies to a state of health among heroin/cocaine/crack users which has worsened overall and to problems which are not limited to AIDS and overdoses.

The results of this study reveal an upward trend in mortality at the beginning of the 1990s followed, since the middle of that decade, by a strong decline linked to the fall in mortality from AIDS and overdoses among those arrested, then finally a stabilisation at the end of the 1990s. This fall coincides with the introduction of tritherapies and the spread of substitution treatments. These trends are similar to those for deaths from overdose and AIDS among those arrested which are generally used as indicators of mortality linked to illicit drug use.

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Definitions

Mortality rate in person-years (PY): the populations whose mortality is being studied here were included in this study on different dates (1992, 1993, 1996 and 1997). Reasoning in terms of person-years (PY) allows differences in exposure period to be taken into account. Each subject included generates a number of person-years, which is the number of years during which the subject was exposed to the risk-of-dying factor.

Standardised mortality ratio (SMR): this indicator expresses the high mortality in a specific population compared with a reference population using an identical age structure. It is calculated by relating the number of deaths observed among the individuals arrested to the number expected in this population. This expected figure is obtained by applying to the cohorts being studied the specific mortality by age bracket and gender observed in the French population as a whole in 1997. An SMR greater than 1 means that the mortality in the cohort being studied is higher than the mortality expected and one can, in this instance, talk of excess mortality or high mortality compared with the reference population.