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Are overdoses treated by ambulance services an opportunity for additional interventions? A prospective cohort study

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ARE OVERDOSES TREATED BY AMBULANCE SERVICES AN OPPORTUNITY FOR ADDITIONAL INTERVENTIONS? A PROSPECTIVE COHORT STUDY

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ABSTRACT

Aims To assess whether people who inject drugs (PWID) and who are treated for overdose by ambulance services have a greater mortality risk compared with other PWID, and to compare mortality risk within potentially critical time-periods (1 week, 1 month, 3 months, 6 months, 1 year, 5 years) after an overdose attendance with the mortality risk within potentially non-critical time periods (time before and/or after critical periods).

Design A prospective cohort study.

Setting Oslo, Norway.

Participants 172 PWID street-recruited in 1997 and followed up until end of 2004.

Measurements Interview data linked to data from ambulance records, Norwegian Correctional Services, Opioid Substitution Treatment records and National Cause of Death Registry. Separate Cox regression models (one for each critical time-period) were estimated.

Findings Ambulance services treated 54% of the participants for an overdose during follow-up. The mortality rate was 2.8 per 100 person years for those with an overdose and 3.3 for those without; the adjusted hazard ratio (HR) was 1.3 [95% CI 0.6; 2.6 p=0.482]. Mortality risk was greater in all but the shortest critical time-period following ambulance attendance than in the non-critical periods. The mortality risk remained significantly elevated during critical periods even when adjusted for total time spent in prison and substitution treatment. The HR ranged from 9.4 [95% CI 3.5, 25.4] in the month after an overdose to 13.9 [95% CI 6.4, 30.2] in the five year period.

Conclusions Mortality risk among PWID is significantly greater in time-periods after an overdose attendance than outside these time-periods.

INTRODUCTION

Mortality rates among people who inject drugs (PWID) remain high in developed countries, despite extensive knowledge regarding risk factors (1-5). One of these risk factors is injecting drug use, which not only increases the risk of death from overdose, but also increases the risk of death from cutaneous injection-related infections, venous disease and blood-borne infections such as hepatitis and HIV (6-8). Other factors that are well known to be associated with higher mortality rates include non-fatal overdoses, older age, being male, having a long injecting career and combining opioid injections with alcohol and/or benzodiazepines (9-12). In addition, there is an increased risk of fatal overdoses among opioid users in the first month after prison release or discharge from abstinence-oriented drug addiction treatment (13-17). It is often a *combination* of these risk factors that increases the mortality risk, and so identifying a particularly high-risk subgroup or a high-risk time period is challenging.

A wide range of interventions has been introduced to reduce risk and harm from injecting drug use. Some of these interventions include opioid substitution treatment (OST), needle exchange programmes, naloxone distribution and promotion of heroin smoking rather than injecting (18-21). However, not all PWID access these interventions and among these mortality rates remain high (2, 3, 22). The most common cause of death in this population is overdose, but death from suicide, violence, motor vehicle accidents and hepatitis C-related causes are also common (23-26). To reduce premature mortality among this population further, it is critical to identify and address those at particularly high mortality risk within this high-risk population.

Slightly more than half of those who experience an overdose are attended by ambulance services (11, 27). Thus, ambulance services play an important role in the prevention of overdose deaths (11, 28). In some countries the majority of overdose patients are hospitalised

by ambulance services (29), while in other countries, the majority are released at the scene (30-32).

Research about those treated by ambulance services for a heroin overdose has found that rebound toxicity is rare after naloxone treatment, and it is therefore assumed safe to release patients on the scene (33-35). However, one follow up study that recruited participants via ambulance records found that those attended for an overdose, had a higher mortality risk compared to the general population (36). Three other studies that also recruited their participants from ambulance records found an increased mortality risk among those with multiple overdose attendances (31, 37, 38). Yet, none of the previous studies have assessed the risk of death after an overdose ambulance attendance specifically in street-recruited PWID.

In our study, we examined if those who were treated by ambulance services for an overdose comprised a particular high-risk subgroup, within a high-risk PWID population. The first objective was to estimate if those treated for an overdose by ambulance services had an increased mortality risk compared to those who were not. The second objective was to compare mortality risk within potentially critical time-periods (1 week, 1 month, 3 months, 6 months, 1 year, 5 years) after an overdose attendance with the mortality risk within potentially non-critical time periods (time before and/or after critical time-periods), and to adjust for low-risk time spent in prison and in opioid substitution treatment. If a high-risk subgroup or high-risk time period was identified, this would suggest that specific interventions to reduce the mortality risk should be introduced.

METHODS

Design and study setting

Our study was a prospective cohort study conducted with street-recruited PWID who were approached outside the needle exchange programme (NEP) facility in Oslo in March, June and September 1997. The NEP was the only facility that provided clean injecting equipment free of charge in Oslo, at the time of the study.

All individuals in Norway have a unique personal identification number (Social Security number). Some participants provided this 11-digit number at inclusion to the study. For those who didn't remember it in full (the first 6 digits constitutes the person's date of birth), the full number was successfully retrieved from the National Population Registry based on the combined birth dates and names.

Interview data were merged with the National Cause of Death Registry from inclusion in 1997 through to 31.12.2004. The National Cause of Death Registry provided dates and causes of death. Causes of death were categorized by Statistics Norway according to the international classification system (ICD-9 codes). Ambulance contact dates and reasons for contact between 1.1.1997 and 31.12.2004 were obtained from the ambulance services in Oslo. OST intake and discharge dates between 1.1.1998 and 31.12.2004 were obtained from the OST programme in Oslo. The Norwegian OST programme was established January 1st 1998 (39) and so intake dates did not exist prior to this. Incarceration dates and release dates between 1.1.1997 and 31.12.2004 were obtained from Norwegian Correctional Services.

Participants, recruitment and interviews

Participants were recruited on the street outside the NEP facility after they had collected injecting equipment. Researchers and trained research assistants from The Norwegian Institute for Alcohol and Drug Research recruited and interviewed the participants. The inclusion criterion was for people to have injected at least once in the previous four weeks. Each interview took approximately 15 minutes to complete, and was conducted out of earshot from others. No monetary incentives were given for participation.

Data for this study was collected as part of a regular data collection conducted by the National Institute for Alcohol and Drug Research, based on anonymous interviews, which started in 1993. We applied to the Norwegian Data Inspectorate to recruit, for a limited period of time, participants to a cohort study. In 1997 we were permitted to include up to 200 respondents. The data collection ended in September, and by then 172 PWID had given their consent for participation.

Representativeness

In 1997, the number of injecting drug users in Oslo was estimated to approximately 4000 persons (40). The NEP had 103 000 visits that year and distributed 1 553 400 needle and syringes (41). Since the NEP was the only facility that provided clean injecting equipment free of charge at the time of study inclusion most PWID in Oslo would have been likely to visit the facility at some point during the year. Data was collected three times over the year, which increased the likelihood of obtaining a representative sample. Furthermore, the gender and age distribution of our sample was similar to what was recorded elsewhere for PWID in Norway at the time (40). People who inject drugs regularly are more likely to attend the NEP

than those who inject less frequently. Consequently our sample probably included a higher proportion of the former population than the latter group.

We have no information about those who refused to participate. However, some who did not agree to long-term participation still answered the questionnaire anonymously (n=114), and those who agreed to participate long-term did not differ from those who only participated anonymously. Both groups had a similar distribution in terms of age, gender, education, age at first injection, income, amount of heroin per injection and total amount of heroin consumed (42).

Measures

The questionnaire sought demographic data such as age, gender, education and current living situation and sources of income (work, social benefits, dealing, theft and sex work). The questionnaire also included questions about substance use such as heroin, other opioids, amphetamine, cocaine, alcohol and cannabis. Respondents were asked about their age at their first injection, injection frequency and what substance they most commonly injected; heroin, amphetamine, both or other substances. Additionally, we included questions about prescription drugs (frequency, type of drug and amount). In 1997, methadone and buprenorphine were not available as prescription drugs in Norway. The questionnaire is described in more detail elsewhere (42, 43).

Data linkage

Norwegian Social Science Data Services staff performed linkage between mortality data from The National Cause of Death Registry, Ambulance contact dates, OST intake and discharge dates, and incarceration and release dates. The Social Security number was used for matching purposes. A de-identified linked data set was then provided for analysis.

Variables and data analyses

All analyses were conducted in Stata 13.1. Student t-tests and proportion tests were used for the assessment of differences in baseline characteristics between the two groups "overdose" and "no overdose".

Crude mortality rates (CMR) per 100 person-years (PY) were calculated by dividing total number of deaths during the follow-up period by the total PY contributed by each participant.

For survival analysis, time-at-risk was the period between inclusion and 31.12.2004. As the register data was complete, we did not lose any participants during follow-up. Participants were censored at death. The proportionality assumption was satisfied as it was tested using Schoenfeld residuals, scaled Schoenfeld residuals and the stphtest in Stata (44). A Cox regression survival model could therefore be applied and hazard ratios (HR) and 95% confidence intervals (CI) are reported. The Cox regression models were adjusted for gender, age at inclusion, length of injecting, total time spent in prison and total time spent in OST. Variables in the adjusted models were included because they were known risk factors for overdoses and premature mortality among PWID (45-49).

The second study objective was to examine the mortality risks within potentially critical time-periods after an overdose treatment by ambulance services (i.e., one month) as compared with potentially non-critical time periods (time before and/or after the critical time-periods). Thus, this was not a comparison between groups, but between time-periods. The number of persons who died within the potentially critical period was divided by exposure time within this specific period. The number of persons who died in the potentially non-critical time-period or died without any overdose treatment, was divided by exposure time in this specific period, including exposure time to death for those who did not have an overdose attendance.

A set of dichotomous time dependent indicators was constructed, with values of 1 if the participant was observed within the critical time-period following the ambulance attendance and 0 if observed within the non-critical time-period. This set of indicators thus captured the dichotomy of interest (i.e., specified time-window after the ambulance attendance vs. the non-critical time period). Each indicator thus fluctuated between 0 and 1 during the study time until death or censoring for those who experienced an overdose attendance and was 0 for those who did not experience an attendance during follow-up. Some individuals had more than one attendance. A total of 6 indicators was created, one for each critical period (i.e., from 1 week to 5 years) corresponding to a total of 6 Cox regression models examining mortality within that specific period. That is, this indicator was added as an independent factor to the Cox regression models, allowing us to compare mortality rates between the critical time-period and the non-critical time-period: 1-week after ambulance attendance vs. the non-critical time-period; 1-month after ambulance attendance vs. the non-critical time-period, etc. There were no deaths after five years and therefore time-periods after five years were not examined.

Data about imprisonment and ambulance contact dates were available from 1.1.1997, so data were left censored (imprisonment and ambulance contacts dates before inclusion date for each individual were omitted from the analyses). Incomplete spells for both prison and OST from 31.12.2004 were right censored.

Funding

The Norwegian Institute for Alcohol and Drug Research funded this study.

Ethics

This study was approved by the Norwegian Medical Ethics committee, the Norwegian Data Inspectorate and the Norwegian Board of Health Supervision.

RESULTS

Description of the sample

Ambulance services had treated 93 (54%) of the 172 study participants for an overdose at least once during the period between the baseline interview in 1997 and 31.12.2004. The number of overdose episodes ranged from one to 17, and the median was two. Thirty-three of the participants (35%) had experienced one episode, 22 (24%) had two episodes, 20 (22%) had three to four episodes, and 18 (19%) had more than four episodes.

There were no statistically significant differences in baseline characteristics between those who had an overdose attendance (n=93) and those who had not (n=79). The proportion of men among the overdose group was 71% and 78% among the no overdose group. Although not statistically significant, a slightly higher proportion from the overdose group reported sex work as an income source (16% vs. 8%). Both groups comprised mainly of persons who injected daily or almost daily (90%), and roughly 9 out of 10 injected mainly heroin. The overdose group reported a slightly higher mean amount of heroin consumed in the month prior to the baseline interview (21.6 g vs. 16.9 g) and a slightly higher proportion reported use of prescription drugs, yet none of these differences were statistically significant.

Insert Table 1 approximately here

Crude mortality rates and risk of mortality

The overdose group was followed for a total of 617 PY and by the end of the study, 17 had died. Similarly, those with no overdose were followed for a total of 519 PY and 17 died. The CMR was 2.8 [95% CI 1.7; 4.4] per 100 PY for those with overdose episodes and 3.3 [95% CI 2.0; 5.3] for those without. Using cox regression analysis the unadjusted HR was 0.8 [95%

CI 0.4; 1.6 p=0.594] and the adjusted was 1.3 [95% CI 0.6; 2.6 p=0.482]. This means that there was not a statistical difference in mortality risk between the two groups.

In addition, we analysed the association between the number of non-fatal overdoses and mortality, but there was no significant association (HR 0.9 95% CI 0.8, 1.1 p=0.410). The causes of death in both groups are found in Table 2. The majority in both groups died from acute intoxications, mainly due to the use of opioids.

Insert Table 2 approximately here

The second study objective was to compare mortality risk within potentially critical time-periods after an overdose attendance with the mortality risk within potentially non-critical time-periods (time before and/or after critical time-periods). Table 3 shows the number of deaths, the years at risk, and the CMR for subsequent periods after treatment. In Table 4, the unadjusted and adjusted HR is shown for all the examined critical time-periods. Apart from the first week after an episode, there was a significantly elevated mortality risk for all the other critical periods. For instance, the risk of death was almost ten times higher during the month after an overdose attendance compared to the non-critical time-period (HR 9.9 [95% CI 3.7, 26.2]). The unadjusted mortality risk remained elevated, even five years after an overdose episode (HR 11.3 [95% CI 5.4, 23.9]). Importantly, the adjusted risk of mortality remained significantly elevated also when controlled for gender, age, years of injecting and total time spent in prison and OST.

Insert Table 3 and 4 approximately here

DISCUSSION

Ambulance services had treated 54% of the 172 street-recruited PWID for an overdose at least once during follow-up. The median number of overdose attendances among this group was two. There were no statistically significant differences in baseline characteristics between those with overdose episodes and those without. Most importantly, there was no significant difference in mortality risk between the two groups. However, in the comparison of mortality risk between potentially critical and non-critical time-periods the risk was greater in all but the shortest critical period following overdose treatment. The mortality risk remained significantly elevated during critical periods even when adjusted for total time spent in prison and substitution treatment.

Potentially, everyone in the study cohort could be at particularly high risk of mortality. In a previous analysis of this data set it was found that the females were 39 times more likely to die prematurely compared to women in the general population, while men were 21 times more likely compared to men in the general population (43). The majority of the cohort injected heroin daily or almost daily, and approximately half of the cohort also used prescription drugs, which in combination are known to increase the risk of overdose mortality (9, 45, 50). Long-term injecting of drugs is another recognized risk factor for overdose mortality (51-53) and the individuals in our cohort had injected on average more than fourteen years at inclusion. Furthermore, in the early years of the study OST was only available with limited access, which further increased the mortality risk (39). The combination of high-risk behaviors, long injecting careers and limited OST availability, suggest that this cohort was particularly prone to premature death.

Our findings suggest that there is a significantly elevated mortality risk in the time-periods after being treated by ambulance services for an overdose, except for in the 1-week period, when compared with non-critical time periods. The most common cause of death was overdose. Previous studies have found that rebound toxicity and death in the immediate days after an overdose attendance, are rare among those who are left on the scene by ambulance services after naloxone treatment (12, 28, 33-35). This could suggest that an individual survive the first few days after an overdose attendance, but thereafter there is an increased risk of death in particular from a new overdose. The risk of death was almost ten times higher during the subsequent month after an overdose attendance compared with the non-critical time-period and the risk of mortality remained significantly elevated even five years after an overdose episode. Similar to the caution that is advised after prison release or after discharge from drug-free treatment (13, 15, 54), the same caution should probably be taken when someone is treated for an overdose by ambulance services. Specially designed interventions such as low threshold OST, and/or referral to other health services, and distribution of take-home naloxone could be introduced and implemented after an overdose attendance to reduce the risk of mortality.

There have been some changes over the years in the characteristics of the PWID population that may mean that our study cohort of PWID differs slightly from PWID populations today. Today the PWID population is older and a much higher proportion receives OST (1). However, our main findings are still applicable. In Norway, the number of overdose deaths was somewhat reduced at the same time as the number of OST patients increased (55, 56). However, the number of overdose deaths has remained stable with around 250 to 300 deaths yearly since 2002 despite that the number of OST patients nearly tripled between 2002 and 2011 (56). Importantly, PWID not only in Norway, but also in other countries, still have a

substantially increased risk for premature death, and overdoses remain the main cause of death in this population (1, 2). Additionally, ambulance services continue to play an important role in the treatment of drug overdoses (28-30, 37, 38). Thus, despite some differences in characteristics between the study cohort and PWID today, our findings are likely to be applicable in most settings where ambulance services treat PWID for overdoses.

Strengths and limitations

One of the strengths of our study lies in how we recruited the participants. Street-recruited PWID include those who may never enter treatment, nor be incarcerated and thus would have been excluded from studies that recruited from treatment centers or prisons. Further, the availability of registries based on social security numbers in Norway is rather unique, and this strengthens our findings. The registries made it possible to examine ambulance attendances and their associations with mortality risk, while controlling for low risk periods such as time spent in prison and time spent in OST. Given the extensive use of ambulance services to treat overdoses also in other countries the potential implications of our findings may influence mortality rates also elsewhere.

A limitation of our seven-year prospective study among street-recruited PWID, was the small sample size. We recognise that a larger study sample would have been more beneficial. In addition, it is possible that at the time of the study, some PWID were not using the NEP, and so they would have been inadvertently excluded from our cohort. Furthermore, we did not have any information about overdose treatments by ambulance services prior to inclusion. It could be that those who had no overdose attendance during follow-up, did have overdose attendances prior to inclusion. This may be the reason for the lack of difference in mortality between the two groups (overdose vs. no overdose). Lastly, reasons for ambulance episodes

were not recorded according to a set standard within the ambulance records, and therefore it is possible that the number of overdose attendances was underestimated.

Conclusion

Our findings suggest that a general investigation of overdose experiences does not uncover those at particular high mortality risk within an already high-risk PWID population. Instead, our findings show that there was a significantly elevated mortality risk in critical time-periods after an individual had been treated by ambulance services for an overdose compared to non-critical time-periods. Importantly, the risk remained significantly elevated even five years after an attendance. The elevated mortality risk in time-periods after an overdose attendance suggests that this attendance may be an opportunity to arrange follow-up interventions such as direct referral to OST and/or to other health services, and distribution of take-home naloxone.

COMPETING INTERESTS

There are no competing interests

AUTHORS' CONTRIBUTIONS

ALBJ designed the study, wrote the research protocol and carried out the data collection. LG analysed and interpreted the data, managed the literature searches and summaries of previous related work, and drafted the manuscript. ALBJ participated in the interpretation of the data and revised the manuscript critically for intellectual content. Both authors read and approved the final manuscript.

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TABLES

Table 1. Baseline characteristics amongst those treated by ambulance services for an overdose and those who were not.

Characteristics	Overdose contacts n=93	No contact n=79 (100%)	Test statistics
Male	71% (66)	78% (62)	z=1.1 p=0.260
Age at interview	31.8 (sd 6.8)[c]	33.4 (sd 7.4)	t=1.3 p=0.097
>Mandatory years of education [a]	71% (66)	72% (57)	z=0.2 p=0.864
Work income	14% (13)	16% (13)	z=0.5 p=0.651
Sex work	16% (15)	8% (6)	z=-1.7 p=0.088
Theft	40% (37)	35% (28)	z=-0.6 p=0.558
Dealing	34% (11)	41% (32)	z=0.8 p=0.410
Age at first injection	18.12(5.74)	17.94 (sd 5.0)	t=-0.2 p=0.827
Years of injecting [b]	13.7 (sd 8.3)	15.4 (sd 8.8)	t=1.3 p=0.212
Daily or almost daily injections	90% (84)	90% (71)	z=-0.1 p=0.922
Heroin most injected	94% (87)	87% (69)	z=-1.4 p=0.163
Mean monthly heroin consumption	21.6 g (sd 21.3)	16.9 g (sd 16.2)	t=-1.5 p=0.131
Any use of prescription drugs	62% (58)	52% (41)	z=-1.4 p=0.166
Alcohol ≥2 days a week or more	23% (21)	25% (20)	z=0.4 p=0.675
Cannabis ≥2 days a week or more	35% (33)	41% (32)	z=0.7 p=0.498

[a] In Norway all children are expected by law to attend school for 10 years.
Prior to 1997, it was nine years.
[b] Age of first injection subtracted from age at inclusion
Notes: z=Proportions test and t=Student t-test

Table 2. Causes of death in the two groups "overdose" and "no overdose"

Characteristics	Overdose n=93	No overdose n=79
Acute intoxications		
due to the use of opioids	10	7
due to use of sedatives or hypnotics	0	1
Accidental poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified	2	0
Dependence syndrome due to use of opioids and due to multiple drug use and use of other psychoactive substances	1	1
Suicide	2	1
Chronic infections (hepatitis C and HIV)	0	2
Other causes (Traffic accidents, drowning, asthma**,** malignant neoplasm of other connective and soft tissue)	2	5

Table 3. Deaths and years at risk by time, since treated for an overdose by ambulance services. CMR per 100 PY.

Time after overdose contact	Deaths	Years at risk	CMR [95% CI]
Up to 1 week	1	5	20.0 [1.8, 93.2]
1- 4 weeks	4	15	26.7 [8.9, 63.4.]
5-12 weeks	4	29	13.8 [46.1, 32.8]
13-24 weeks	3	35	8.6 [23.7, 22.9]
25-52 weeks	1	37	2.7 [2.5, 12.6.]
1-5 years	4	13	30.8 [10.3, 73.2]
>5 years	0	14	0 [-0.0, 17.6]
Total	17	148	11.5 [6.9, 18.0]

Table 4. Risk of death after overdose treated by ambulance services within potentially critical time-periods compared to potentially non-critical time-periods

Potential critical time periods[a]	Hazard Ratio (95% CI)		
	Unadjusted	Adjusted[b]	Potential non-critical time periods[c]
1 week	6.4 [0.8, 48.3]	6.0 [0.8,48.1]	1
1 month	9.9 [3.7, 26.2]**	9.4 [3.5,25.4]**	1
3 months	8.1 [3.7, 17.8]**	7.7 [3.5,17.2]**	1
6 months	7.2 [3.5, 15.0]**	7.8 [3.7,16.3]**	1
1 year	5.8 [2.8, 11.9]**	7.3 [3.5,15.3]**	1
5 years	11.3 [5.4, 23.9]**	13.9 [6.4,30.2]**	1

** $p < 0.001$

[a] This was a comparison between potentially critical time-periods and potentially non-critical time periods using a separate Cox regression model for each critical period. The number of persons who died within the potentially critical period was divided by exposure time within this specific period. The number of persons who died in the potentially non-critical period or died without any contact, was divided by exposure time within the non-critical period, including exposure time to death for those who did not have an overdose attendance.

[b] Adjusted for gender, age, total years of injecting, total years spent in prison and total years spent in OST.

[c] This is time before and/or after potentially critical time-periods.

Table XX. Ambulance and Emergency Room attendances in the year before the individual died

	Total attendances	Mean (sd)	Median	max
Total ambulance attendances* n=85	173	2 .03 (1.88)	1	10
Overdose attendances (n=29)	48	1.66 (0.90)	1	4
Drug related NOT overdose attendance[b] n=15	16	1.07 (0.26)	1	2
Other attendances[c] n=61	109	1.79 (1.61)	1	9
Acute care clinic n=125	503	4.02 (5.1)	2	31
Antall OD (n=14)	21	1.50 (0.85)	1	4
Antall drug related (n=41)	74	1.80 (1.50)	1	8
Other attendances (n=113)	408	3.61 (4.09)	2	34

NB! The three categories within total ambulance attendances are not exclusive. A person could have OD attendance, Drug related NOT OD attenandance and other attendances.

[b]Description of this category

[c] Description of this category

Table XX Reasons for ambulance attendance and Emergency room visits Se excel ark i google drive. Dette er en mer detaljert tabell. Kutte den ut, kanskje?

	Ambulance attendance (n=85)	Acute care clinic (n=125)*
Overdose	48	21
Drug or alcohol related not overdose	16	74
Psychiatry	11	59
Other illness	45	101
Fall, broken limbs, sprains etc	23	138
Unconscious	23	3
Pain (stomach, back, chest etc)	7	24
Brought in by police	-	7
Left before consultation	-	19
Social emergency services	-	57
Total	173	503

Table XX Referral after an ambulance attendance

	Brought to the Acute care clinic	Treated at the scene	Hospitalized	Total
Overdose	10 (21%)	28 (58%)	10 (21%)	48 (100%)
Drug or alcohol related not overdose	4 (25%)	8 (50%)	4 (25%)	16 (100%)
Other	34 (31%)	19 (18%)	56 (51%)	109 (100%)
Total	48 (28%)	55 (32%)	70 (40%)	173 (100%)

Table 1: Characteristics and circumstances of death among persons with emergency service contact compared to persons without ES contact the year prior to fatal overdose in Oslo, Norway 2006-2008. N=231

	Emergency service contact	
AC	Yes (n=141)	No (n=90)
Age: median years (range)	36 (19-59)	37 (18-57)
Women (%)	30 (21.3)	21 (23.3)
Oslo residents (%)	99 (70.2)	59 (65.6)
Place of death		
Private [a] (%)	93 (66.0)	62 (68.9)
Outside/public building (%)	33 (23.4)	23 (25.6)
Institution (%)	8 (5.7)	4 (4.4)
Main intoxicant		
Heroin (%)	91 (64.5)	61 (67.8)
Methadone/buprenorphine (%)	13 (9.2)	12 (13.3)
Strong pain relievers[b] (%)	14 (9.9)	6 (6.7)
Other drugs detected in blood		
Benzodiazepines/hypnotics[c] (%)	100 (70.9)	60 (66.7)
Stimulants [d] (%)	47 (33.3)	31 (34.4)
Cannabis (%)	24 (17.0)	17 (18.9)
Ethanol (%)	27 (19.1%)	18 (20.0%)
Multiple drugs detected in blood	123 (87.2)	74 (82.2)

[a] Includes shelters in addition to private homes
[b] Fentanyl, oxycodone, codeine, dextropropoxyphene, tramadol
[c] flunitrazepam, diazepam, nitrazepam, alprazolam, oxazepam klonazepam, fenazepam, alimemazin, prometazin, zolpidem, zopiclone
[d] Cocaine, amphetamine/methamphetamine, ecstasy

Slettet: (ES)

Formatert: Fransk (Frankrike)

Table 2: Reasons for emergency service attendance among persons who died from overdose in Oslo, Norway 2006-2008.[a]

	Reasons for contact Total n=141 n (%)[b]	Most recent contact Total n=141 n (%)[b]
Somatic disease[c]	67 (47.5%)	33 (23.4%)
Drug-related (drug use/non-fatal overdose) reasons	64 (45.4%)	42 (29.8%)
Injury (assault, fall, fractures, injury from car accidents and other bodily trauma)	49 (34.8%)	20 (14.2%)
Other reasons (Prescription renewal, transportation and home visits)	35 (24.8%)	2 (1.4%)
Psychiatric/psychosocial reasons	31 (22%)	13 (9.2%)
Use of social emergency services	22 (15.6%)	13 (9.2%)
Unconscious	17 (12.1%)	7 (5.0%)
Left before consultation	10 (7.1%)	1 (0.7%)
Alcohol-related reasons	7 (5.0%)	1 (0.7%)

[a] Please refer to the Methods section for a more detailed description of what contacts reasons were included into the different categories
[b]Persons may be included into more than one category.
[c]This category included all conditions, diseases and disorders that were somatic and that could not be classified elsewhere

Kommentert [SS1]: Siste kontakt før døden . Kan vi få det kalrere?

Table 3: Association between emergency service contact and other health and social service contact, N=231. Logistic regression with unadjusted and adjusted odds ratios (OR). The group with no emergency contact is reference group.

	Emergency service contact		OR for emergency service utilization	
	Yes (n=141)	No (n=90)	OR (95%CI) Unadjusted	OR (95%CI) Adjusted [a]
Social service	78 (55.3%)	32 (35.6%)	2.2 (1.3; 3.9)	2.2 (1.1; 4.3)
Hospital	72 (51.1%)	25 (27.8%)	2.7 (1.5; 4.8)	2.5 (1.4; 4.6)
Low threshold services	41 (29.1%)	11 (12.2%)	3.0 (1.4; 6.1)	2.1(1.0; 4.5)
Drug rehabilitation treatment	36 (25.5%)	14 (15.6%)	1.9 (1.0; 3.7)	-
Opioid maintenance treatment	17 (12.1%)	12 (13.3%)	0.9 (0.4; 2.0)	-
Home care	24 (17.0%)	9 (10.0%)	1.8 (0.8; 4.2)	-

[a]Adjusted for age, gender, p residency and contact with social service/hospital/low threshold service one year prior to death

Figure 1: Frequency of contact with other health and social services other than emergency services (ES) among persons who died from overdose in Oslo, Norway 2006-2008, N=231. One group (n=141) with ES contact prior to death compared to one group with no ES contact (n=90).