

Living conditions in the districts of Oslo and poisonings by substances of abuse treated at casualty clinic level

BACKGROUND Use of and acute poisoning by substances of abuse represent a major health problem and are often linked to social destitution. We describe associations between place of residence, living conditions and the incidence of poisoning by substances of abuse in Oslo.

MATERIAL AND METHOD All patients who were 12 years of age or older and resident in Oslo and who were treated for acute poisoning by substances of abuse at the Oslo Accident and Emergency Outpatient Clinic (OAEOC) were included prospectively for a continuous period of one year, from October 2011 to September 2012. The 15 districts of Oslo were categorised into three groups of living conditions, from the best (I) to the poorest (III) living conditions, based on the City of Oslo's living conditions index. Homeless people were grouped separately. The incidence of poisoning by substances of abuse treated in the OAEOC was estimated.

RESULTS Of a total of 1 560 poisonings by substances of abuse, 1 094 cases (70 %) affected men. The median age was 41 years. The most frequent toxic agents were ethanol, with 915 cases (59 %), and heroin, with 249 cases (16 %). The incidence of poisoning by substances of abuse treated in the OAEOC per year per 1 000 inhabitants amounted to 1.75 in living conditions group I, to 2.76 in living conditions group II and 3.41 in living conditions group III. Living conditions group III had a significantly higher incidence than living conditions group II ($p < 0.001$), and living conditions group II had a significantly higher incidence than living conditions group I ($p < 0.001$).

INTERPRETATION The incidence of acute poisoning by substances of abuse was higher, the poorer the living conditions in the district.

Acute poisonings are a serious health problem and often require treatment in hospital and/or at the pre-hospital level (1–3). There seems to be an inverse correlation between both the incidence and the degree of severity of acute poisonings on the one hand and socioeconomic status on the other (4, 5).

Poor health and poor living conditions are correlated (6, 7). In Oslo, the socioeconomic differences are wider than in the rest of Norway, and there is a greater distance between the top and the bottom with regard to practically all living conditions variables (8, 9). There are considerable differences between the eastern and western districts. Previously, the central eastern districts had the lowest scores, but recent studies show that the largest proportion of people with health problems is now found in the eastern and southern suburbs (9). In addition, Oslo has numerous homeless people, a group with higher morbidity, more substance addicts and greater socioeconomic problems than the rest of the population (10).

A previous study from Oslo showed an elevated incidence of poisoning treated in hospitals in districts with poorer living conditions (11). This study excluded the homeless. Moreover, as much as 60–70 % of the treatments of acute poisonings by sub-

stances of abuse are completed outside hospitals, at the Oslo Accident and Emergency Outpatient Clinic (OAEOC) (1, 12–14).

Objective

In this study we describe associations between living conditions and acute poisonings by substances of abuse by collating the incidence and the toxic agent in persons treated at the OAEOC with the living conditions in the district where the patient is resident. We also describe the incidence by gender and age, as well as poisonings by substances of abuse among homeless persons.

Material and method

The OAEOC is open 24 hours, serves the entire city and has approximately 200 000 consultations each year. It is located in Storgata in central Oslo, and patients are accepted irrespective of their place of residence, including persons from out of town. The OAEOC treats numerous patients with acute poisoning by substances of abuse, whereas in other parts of the country these would have been treated in hospital. Patients with acute poisoning by substances of abuse are kept under observation for up to four hours according to a set procedure (15). There are some private casualty clinics in Oslo, as well as a further municipal

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e-Box 1 appears in the online issue.

MAIN MESSAGE

In this study we found a clear association between poor living conditions and the incidence of acute poisoning by substances of abuse.

The highest incidence of poisoning by substances of abuse was found in the central districts of St. Hanshaugen, Gamle Oslo, Grünerløkka, Sagene and Frogner.

The incidence of acute poisoning by substances of abuse was nearly 50 times higher among homeless persons than in the rest of the city's population.

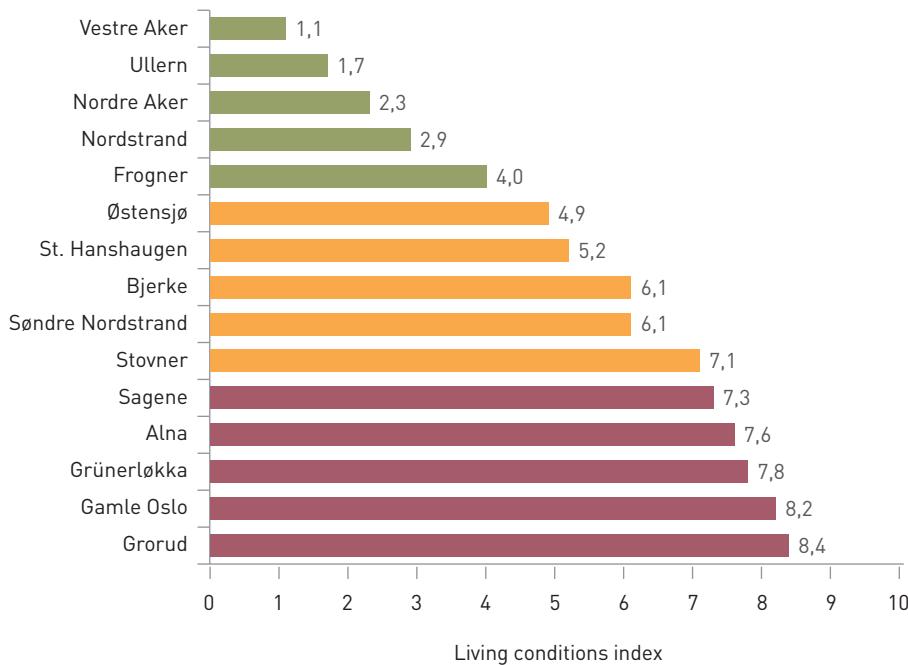


Figure 1 City districts divided into living conditions groups on the basis of the City of Oslo's living conditions index for 2005, prepared by the City of Oslo Development and Competence Agency [17]. Living conditions group I (green) has the best living conditions, group III (red) has the poorest, while group II (yellow) is in an intermediate position. The living conditions index ranks the districts on a scale from 1 (best) to 10 (poorest living conditions). The average index score for all districts is 5.1



Figure 2 Oslo city districts divided into living conditions groups. Living conditions group I (green) has the best living conditions, group III (red) has the poorest, while group II (yellow) is in an intermediate position

casualty clinic in Aker Hospital, but none of these to any notable extent treat patients with acute poisoning by substances of abuse. However, some patients are brought directly to hospital by the ambulance services.

Inclusion

All those who were 12 years and older and who were treated for acute poisoning by substances of abuse at the OAEOC were included in the study, irrespective of the intention behind the poisoning incident. Patients were included continuously from 1 October 2011 to 30 September 2012.

Those who were treated for other conditions but also had sustained an acute poisoning by a substance of abuse were included if the poisoning in itself was sufficiently serious to merit observation or treatment. Those who were later admitted to hospital remained included. Patients who did not have a Norwegian national identity number and those who were registered as resident outside Oslo were excluded. Homeless persons, defined as individuals with a Norwegian national identity number but no address record in the National Registry, remained included.

Classification of districts and living conditions groups

The patients were assigned to one of Oslo's 15 districts on the basis of their address at the time of the poisoning incident. The 2004 subdivision of Oslo's districts was used. We have used the population figures for each district as of 1 January 2013 (16).

The Norwegian Institute of Urban and Regional Research has estimated that there were 1 376 homeless persons in Oslo in 2012 (10).

The 15 districts were classified into three living conditions groups on the basis of the City of Oslo's living conditions index for 2005 (17). E-Box 1 shows the indicators that were used to construct the index. On the basis of the indicators, the Oslo districts are ranked with scores ranging from 1 (the best living conditions) to 10 (the poorest living conditions).

Living conditions group I included the five districts with the best living conditions, living conditions group III the five with the poorest living conditions and living conditions group II the remaining five districts. The living conditions index and the living conditions groups are shown in Figure 1. The geographical location of the districts is shown in Figure 2. The same subdivision was used in a previous study of living conditions and place of residence in hospitalised patients with acute poisoning (11). We calculated the incidence of acute poisoning by substances of abuse in each of the 15 dis-

tricts as well as in the three living conditions groups.

Data registration

The doctor treating the patient registered the age, gender and the main toxic agent on a pre-defined form. Place of residence was retrieved from the National Registry via the electronic patient records.

The doctor diagnosed the toxic agent on the basis of information available at the time – statements from the patient and any accompanying persons, a clinical examination and information from ambulance personnel and the police. The only available toxicological test was a breath test for ethanol. In cases of poisoning with more than one agent, the main toxic agent was defined as the one that was deemed to be most toxic in the doses assumed to have been taken. The substances of abuse that had been pre-categorised on the form included ethanol, heroin, other opioids, benzodiazepines, amphetamine, cocaine, ecstasy, gammahydroxybutyrate (GHB) and cannabis. Other substances of abuse could be entered in the category «other agents».

Statistics

The analyses were undertaken in IBM SPSS version 21 (IBM Corp.) as well as in a web-based calculator supplied by EpiTools (<http://epitools.ausvet.com.au>). The chi-square test was used to compare categorical variables, while Mann-Whitney's U-test was used to compare continuous variables.

The total incidences in the living conditions groups were compared with the aid of a chi-square test, pairwise as well as for trends. The incidence among the homeless was compared to the total incidence for the living conditions groups with the aid of the chi-square test. The significance level was set to $p < 0.05$.

Ethics

The study was undertaken in conformity with the Declaration of Helsinki. Patients were included after having provided oral consent. The consent was obtained after the observation and treatment had been completed, and the patients had woken up and were ready for discharge.

The project was approved by the Regional Committee for Medical and Health Research Ethics (REK South-Eastern Norway) (REK no. 2010/1129-1), as well as by the data protection officer at Oslo University Hospital.

Results

In the course of one year, altogether 2 499 cases of acute poisoning by substances of abuse were treated at the Oslo Accident and Emergency Outpatient Clinic, and of these, a

Table 1 Age, gender and place of residence for 1 560 cases of acute poisoning by substances of abuse, treated in Oslo Accident and Emergency Outpatient Clinic in the course of one year

| Place of residence | Cases Number [% of total] | Age (years) Median [range] | Men Number [% within the living conditions group] |
|-----------------------------|---------------------------------|-------------------------------|---|
| Living conditions group I | 341 [22] | 36 [15-84] | 209 [61] ¹ |
| Living conditions group II | 421 [27] | 39 [15-87] | 299 [71] |
| Living conditions group III | 614 [39] | 42 [13-85] ² | 416 [68] |
| Homeless | 184 [12] | 44 [20-78] ³ | 170 [92] ⁴ |
| Total | 1 560 [100] | 41 [13-87] | 1 094 [70] |

¹ Smaller proportion of men than in living conditions groups II and III (I versus II $p = 0.006$; I versus III $p = 0.052$)

² Older than in living conditions groups I and II (I versus III $p = 0.003$; II versus III $p = 0.024$)

³ Older than in the other living conditions groups (homeless versus I $p < 0.001$ versus II $p < 0.001$, versus III $p = 0.013$)

⁴ Larger proportion of men than in the other living conditions groups (homeless versus I $p < 0.001$, versus II $p < 0.001$, versus III $p < 0.001$)

total of 1 560 (62 %) involved patients who were resident in Oslo or homeless. The others were excluded, 181 (7 %) because they did not have a Norwegian national identity number and 758 (30 %) because they were registered as resident outside Oslo. Of these 1 560 included cases, altogether 1 094 (70 %) were men. The median age was 41 years (Table 1).

Incidence

The incidence of acute poisoning by substances of abuse per year per 1 000 inhabitants amounted to 1.75 in living conditions group I; 2.76 in living conditions group II; and 3.41 in living conditions group III (Table 2). The incidence of poisoning by substances of abuse in Oslo as a whole amounted to 2.95 per 1 000 inhabitants. The incidence in living conditions group III was significantly higher than in living conditions group II ($p < 0.001$), and the incidence in living conditions group II was significantly higher than in living conditions group I ($p < 0.001$). The incidence among homeless persons amounted to 134 per 1 000, far higher than in any of the other living conditions groups ($p < 0.001$).

Seen as a whole, the incidence was approximately identical in both genders in the age group 12–20 years (men 2.94 per 1 000; women 2.45 per 1 000), but it was significantly higher in men aged 21 years and older (Table 3). This notwithstanding, the age distribution pattern was identical for men and women within each living conditions group. Altogether 37 patients were younger than 18 years, of whom 12 belonged to living conditions group I, another 16 to living conditions group II and nine to living conditions group III.

Toxic agents

The most frequently occurring toxic agents included ethanol, with 915 cases (59 %) and heroin with 249 (16 %). Among homeless persons there was a larger proportion of heroin poisonings than in the other living conditions groups (Table 4). The proportion of heroin poisonings was highest in the St. Hanshaugen district, which alone accounted for 37/77 of the heroin poisonings (48 %) in living conditions group II and 37/249 of the total number of heroin poisonings (15 %). In those under 18 years, ethanol was the most common toxic agent, with 31/37 cases (84 %), followed by cannabis with 4/37 cases (11 %).

Discussion

Poisoning incidence and living conditions

The incidence of poisonings by substances of abuse was higher, the poorer the living conditions. This is in line with previous findings among patients treated for acute poisoning in hospitals in Oslo (11), but our study showed a clearer association. One possible explanation could be that our material consisted of poisonings by substances of abuse, whereas the hospital study included cases related to substance abuse as well as attempted suicides, and thus included a wider panorama of toxic agents. Most likely, the known association between acute poisonings and poor living conditions (4, 5 11) is strengthened by the negative consequences of long-term substance abuse (18).

The association between poor health and low socioeconomic status can be explained by influence, in which poor living conditions cause poor health, as well as by selection, in which poor health increases the risk of having poor living conditions (19, 20), for

Table 2 District-wise incidences per 1 000 inhabitants of acute poisoning by substances of abuse, treated in Oslo Accident and Emergency Outpatient Clinic in the course of one year. Population figures as of 1 January 2013. Chi-square test for linear trend in incidences in living conditions groups: $p < 0.001$

| | Poisonings by substances of abuse Number | Inhabitants Number ≥ 12 years | Incidence Per 1 000 |
|------------------------------------|---|---------------------------------------|------------------------|
| Living conditions group I | | | |
| Nordre Aker | 50 | 40 547 | 1.23 |
| Vestre Aker | 53 | 38 124 | 1.39 |
| Nordstrand | 57 | 40 611 | 1.40 |
| Ullern | 38 | 26 611 | 1.43 |
| Frogner | 143 | 49 103 | 2.91 |
| Total | 341 | 194 996 | 1.75 |
| Living conditions group II | | | |
| Østensjø | 80 | 40 011 | 2.00 |
| Søndre Nordstrand | 61 | 29 875 | 2.04 |
| Bjerke | 50 | 24 303 | 2.06 |
| Stovner | 59 | 25 809 | 2.29 |
| St. Hanshaugen | 171 | 32 664 | 5.24 |
| Total | 421 | 152 662 | 2.76 |
| Living conditions group III | | | |
| Alna | 96 | 40 341 | 2.38 |
| Grorud | 56 | 22 587 | 2.48 |
| Sagene | 107 | 32 808 | 3.26 |
| Grünerløkka | 174 | 44 758 | 3.89 |
| Gamle Oslo | 181 | 39 733 | 4.56 |
| Total | 614 | 180 227 | 3.41 |
| Homeless | 184 | 1 376 ¹ | 134 |
| Oslo as a whole | 1 560 | 529 261 | 2.95 |

¹ The number of homeless has been estimated by the Norwegian Institute of Urban and Regional Research (10)

example through exclusion from the labour market. It has also been demonstrated that a high degree of social inequality in a society is alone a factor that contributes to poorer public health (21).

In our material, the incidence of poisoning by substances of abuse was higher in the older age groups, the poorer the living conditions in the living conditions group (Table 3). This phenomenon could be due to selection, meaning that persons with risky substance-abuse behaviour over time end up in districts with poor living conditions, where housing is cheaper and the density of

municipal housing is higher (9). However, this phenomenon could also be caused by influence – an effect of poor living conditions over time. Similarly, the falling incidence with higher age in living conditions group I could be an effect of good living conditions over time, but may also have been caused by selection if persons with risky substance-abuse behaviour tend to move out of the district.

It is conceivable that patients who come from a wealthier background are cared for at home by their resourceful next of kin, while patients from a poorer background are picked

up on the street and brought to the casualty clinic. On the other hand, it is also imaginable that people living in poor conditions are more habituated to substance-abuse behaviour and their threshold to seeking help may therefore be higher. We are not aware of any studies about this, but we deem it unlikely that this would change the main findings in our study.

The highest incidences of acute poisoning by substances of abuse were found in the central districts (St. Hanshaugen, Gamle Oslo, Grünerløkka, Sagene and Frogner). Most likely, this is due to the fact that social and demographic conditions in the central city districts, in addition to living conditions, have an effect on the incidence of poisoning by substances of abuse. For example, these districts have a considerable proportion of childless couples and young adults (9, 16).

There was no difference in incidence between the living conditions groups among persons younger than 36 years. Weekend binge drinking is common among youth and young adults in Oslo (14), and it may appear that such behaviour is associated with this age group across the variety of living conditions in the districts.

Of all districts, St. Hanshaugen had the highest incidence, which may be related to the fact that many housing programmes for substance abusers are located there. Many of the residents are registered at the address of their housing programme, but not all.

The districts of Søndre Nordstrand, Stovner and Grorud all have relatively poor living conditions, but nevertheless had relatively low incidences of poisoning within their living conditions groups (II and III). The Alna district had the lowest poisoning incidence in living conditions group III. These districts have the city's highest proportion of non-western immigrants, approximately 40 % of the inhabitants (22). Many of the non-western immigrants are Muslims, who tend to be associated with less frequent substance abuse (23). Similar findings were also made in the previous study of patients treated in hospitals (11).

The homeless

The incidence of poisoning was extremely high in the homeless population, 134 per 1 000 per year. This is unsurprising, insofar as approximately half of all homeless persons in Oslo are addicted to substances of abuse (10), which is another indicator of the social problems prevailing within this group. Being homeless appears to constitute a fundamental part of the problem in itself. In places where homeless persons are accepted in housing programmes with no requirement to stay off drugs, their use of medical emergency services is reduced, they have fewer

hospitalisations and it may also appear that their use of substances declines (24).

The Norwegian Institute of Urban and Regional Research believes that they may possibly have underestimated the number of homeless people in Oslo, since they have little information on persons whose affiliation to Norway is weak. The estimated number nevertheless includes some persons who are temporarily resident (10). Only very few of the homeless persons with temporary residence or a weak affiliation to Norway are likely to have a national identity number. Since homeless patients with an acute poisoning by substances of abuse were included in the study only if they possessed a Norwegian national identity number, the real incidence in the homeless population as defined by us is likely to be even higher than our estimates indicate.

Toxic agents

Ethanol was the predominant toxic agent. The proportion of heroin poisonings was highest among the homeless as well as in the middle living conditions group, in which the St. Hanshaugen district accounted for half of all heroin poisonings. Most likely, the high incidence of heroin poisoning in patients from the St. Hanshaugen district is based on the same background factor as the generally high incidence of poisonings in this district – numerous housing programmes for substance users are located there. Among the homeless, heroin was the predominant toxic agent next to alcohol, which is in line with previous studies (25).

Wherever the distribution of toxic agents was identical between living conditions groups (Table 4), the incidence of poisoning from different agents nevertheless differed,

Table 3 Incidence of acute poisoning by substances of abuse per 1 000 inhabitants, by place of residence and age groups

| Age (years) | Living conditions group I | | Living conditions group II | | Living conditions group III | | Homeless | P-value ¹ |
|----------------------|---------------------------|---------------------|----------------------------|---------------------|-----------------------------|---------------------|----------|----------------------|
| | Number | Incidence per 1 000 | Number | Incidence per 1 000 | Number | Incidence per 1 000 | | |
| 12–20 | 54 | 2.64 | 44 | 2.46 | 45 | 3.10 | 1 | 0.57 |
| 21–35 | 113 | 2.04 | 128 | 2.71 | 181 | 2.41 | 51 | 0.087 |
| 36–50 | 88 | 1.81 | 156 | 3.90 | 192 | 4.20 | 82 | < 0.001 |
| 51–65 | 56 | 1.45 | 79 | 2.91 | 158 | 5.85 | 22 | < 0.001 |
| ≥ 66 years | 30 | 0.94 | 14 | 0.69 | 38 | 2.20 | 28 | < 0.001 |
| P-value ² | < 0.001 | | < 0.001 | | < 0.001 | | | |
| Total | 341 | 1.75 | 421 | 2.76 | 614 | 3.41 | 184 | |

¹ Total chi-square test for incidences in living conditions groups per age group

² Total chi-square test for incidences in age groups per living conditions group

with the same gradient as the total incidence. The high proportion of ethanol poisonings in living conditions group I was not due to a higher incidence of such poisonings than in the other living conditions groups, but to relatively fewer poisonings by heroin and benzodiazepines.

The panorama of toxic agents in our material is equivalent to the panorama found in previous studies of acute poisoning treated at casualty clinic level in Oslo (1, 12, 14), but the number of poisonings by substances of abuse has increased considerably over the last decade. This applies especially to GHB, central stimulants and ethanol (14). However, we did not find the same excess

frequency of GHB poisoning in patients from the Frogner district that Kolvik and collaborators (11) found in patients treated in hospitals in 2003. The proportion of ethanol poisonings was significantly higher in our material than in the hospital material studied by Kolvik and collaborators (11), because patients with ethanol poisoning are primarily treated at casualty clinic level in Oslo (1, 12).

Strengths and weaknesses

Our finding of a co-variation between poor living conditions in living conditions groups and a high incidence of poisoning does not constitute a valid basis for drawing any con-

Table 4 Toxic agent and place of residence for 1 560 cases of acute poisoning by substances of abuse, treated in Oslo Accident and Emergency Outpatient Clinic in the course of one year

| Toxic agent | Living conditions group I | | Living conditions group II | | Living conditions group III | | Homeless | | Total | |
|--------------------|---------------------------|-------|----------------------------|-------|-----------------------------|-------|----------|-------|--------|-------|
| | Number | (%) | Number | (%) | Number | (%) | Number | (%) | Number | (%) |
| Ethanol | 238 | [70] | 230 | [55] | 369 | [60] | 78 | [42] | 915 | [59] |
| Heroin | 23 | [7] | 77 | [18] | 71 | [12] | 78 | [42] | 249 | [16] |
| Other opioids | 11 | [3] | 13 | [3] | 26 | [4] | 8 | [4] | 58 | [4] |
| Benzodiazepines | 19 | [6] | 41 | [10] | 62 | [10] | 6 | [3] | 128 | [8] |
| Central stimulants | 21 | [6] | 28 | [7] | 40 | [7] | 7 | [4] | 96 | [6] |
| GHB ¹ | 17 | [5] | 19 | [5] | 28 | [7] | 5 | [3] | 69 | [4] |
| Other | 12 | [4] | 13 | [3] | 18 | [3] | 2 | [1] | 45 | [3] |
| Total | 341 | [100] | 421 | [100] | 614 | [100] | 184 | [100] | 1 560 | [100] |

¹ GHB: Gammahydroxybutyrate

clusions about causality. We have pointed out some possible explanations that we hold to be important, but these associations are complex with numerous contributory factors. Statistically significant findings must be interpreted with caution due to the numerous analyses that have been undertaken.

Patients were included in the study over an entire year, so the study provides a good picture of the panorama of poisonings by substances of abuse in the Oslo Accident and Emergency Outpatient Clinic. On the other hand, it does not provide a complete picture of the poisonings by substances of abuse in the capital city as a whole. Each year, approximately 700 patients are brought directly to hospital by the ambulance services, most of whom with poisonings by medical drugs, but the most severe poisonings by substances of abuse will also be found in this group (1, 13). In addition, some patients remain on site after treatment by ambulance personnel, most often after having received an antidote to opioid poisoning. In 2003, this applied to 528 patients, which means that most heroin poisonings in Oslo are treated by the ambulance services (1). The estimated incidences therefore reflect only the incidences of poisonings by substances of abuse that have been treated in the OAEOC.

In their study of hospital patients with acute poisoning, Kolvik and collaborators found the same incidence pattern that we found (11). We see no reason to believe that patients with heroin poisoning who remain where they are after having received an antidote should have any other district-wise affiliation than similar patients who are brought to the OAEOC. It is likely, however, that some of them will be homeless, and the incidence that we found among the homeless may therefore be underestimated.

No socioeconomic data were registered for the patients included in the study. As a result, we needed to rely on an indirect association in the form of living conditions groups to describe living conditions at the group level. Until 2009, Statistics Norway produced a living conditions index for all Norwegian municipalities, which also included a description of socioeconomic conditions in the various districts in Oslo. However, certain issues that may account for especially large fluctuations between districts in the capital city were not taken into consideration, and the City of Oslo therefore produced its own living conditions index in 2005 (17).

Living conditions indices have certain methodological weaknesses, and minor differences in individual indicators and the weights assigned to them may cause large fluctuations. For this reason, the City of Oslo has also developed other grading tools for socioeconomic conditions in the city districts

(9). We nevertheless chose to use the City of Oslo's living conditions index as the basis for our study, since we deemed it the most valid yardstick available. This index was created to measure living conditions in Oslo specifically, whereas the purpose of the other grading tools was to provide a distribution key for allocating budget funds to the districts (9).

We chose to use the index for 2005, even though a more recent one for 2006 was available, because the 2005 index had been used in the previous study of patients treated for poisoning in hospitals (11). This made the results more easily comparable. Oslo is a city in constant change, but change takes time. We assume the changes in living conditions between the districts to be no larger than to make our subdivision reasonable, and that the changes therefore have had no effect on our main findings.

We used the patient's addresses as registered in the National Registry as the basis to allocate them to districts. Most likely, some patients live in districts other than the one in which they are registered, and some who are registered in other municipalities may live in Oslo. Temporary addresses are occasionally registered in the electronic medical records system at the OAEOC, but these are not systematically updated. We therefore considered the address in the National Registry to represent the best approach to the patients' real place of residence.

No toxicological tests were made for this study except for a breath test for ethanol, and this makes the categorisation of toxic agents somewhat uncertain. This reflects the real clinical situation in the OAEOC, where the diagnosing of toxic agents is clinically based.

Conclusion

We have shown that the poorer the living conditions, the higher the incidence of acute poisonings by substances of abuse. The homeless population had an extremely high incidence and stood out from the other groups in consisting almost exclusively of men and in more frequently having heroin as a toxic agent.

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