Research Paper

Social and economic inequalities in fatal opioid and cocaine related overdoses in Luxembourg: A case–control study

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ABSTRACT

Background: To investigate social and economic inequalities in fatal overdose cases related to opioid and cocaine use, recorded in Luxembourg between 1994 and 2011.
Methods: Cross-examination of national data from law enforcement and drug use surveillance sources and of forensic evidence in a nested case–control study design. Overdose cases were individually matched with four controls, when available, according to sex, year of birth, drug administration route and duration of drug use. 272 cases *vs* 1056 controls were analysed. Conditional logistic regression analysis was performed to assess the respective impact of a series of socioeconomic variables.
Results: Being professionally active [OR = 0.66 (95% CI 0.45–0.99)], reporting salary as main legal income source [OR = 0.42 (95% CI 0.26–0.67)] and education attainment higher than primary school [OR = 0.50 (95% CI 0.34–0.73)] revealed to be protective factors, whereas the professional status of the father or legal guardian of victims was not significantly associated to fatal overdoses.
Conclusions: Socioeconomic inequalities in drug users impact on the occurrence of fatal overdoses. Compared to their peers, users of illicit drugs with lower socioeconomic profiles show increased odds of dying from overdose. However, actual and self-referred socioeconomic characteristics of drug users, such as educational attainment and employment, may have a greater predictive value of overdose mortality than the parental socioeconomic status. Education, vocational training and socio-professional reintegration should be part of drug-related mortality prevention policies.

Introduction

Latest estimates from the United Nations Office on Drugs and Crime (UNODC, 2013) and the World Health Organisation (WHO, 2009) refer to 210,000 and 245,000 drug-related deaths per year worldwide and approximately half of these cases are attributed to acute overdoses. Fatal overdose caused by the use of illicit drugs in Europe accounts for an estimated 4% of premature death in young adults aged 15–39 years (EMCDDA, 2011).

Risk factors for illicit drug-related overdose have been extensively addressed by scientific research. Numerous studies have investigated demographic, behavioural and drug use related parameters associated to drug-related mortality (Darke & Zador, 1996; Degenhardt, Bucello, Mathers, Briegleb, & Ali, 2011; Fischer et al., 2004; Mathers et al., 2013). Research focusing on social and economic determinants appears to be less prevalent, although previous studies have reported associations between fatal overdoses and poor educational attainment (Arias & Borrell, 1998; Farrell, Neeleman, Griffiths, & Strang, 1996), unemployment (Harlow, 1990; Pasarin, Borrell, & Plasencia, 1999), low income (Pasarin et al., 1999; Torralba et al., 1996), poverty status (Jones et al., 2002; Marzuk et al., 1997; Torralba et al., 1996), living in a neighbourhood presenting important income inequalities (Galea et al., 2003; Nandi et al., 2006), homelessness (Langendam, van Brussel, Coutinho, & van Ameijden, 2001; O'Driscoll et al., 2001), poor psychosocial functioning (Darke & Zador, 1996), social exclusion and poor social support (Farrell et al., 1996).

Research addressing socioeconomic determinants in drug users and applying matched case–control designs is limited. Davoli et al. (1993) published a study that investigated risk factors for drug overdose mortality, including 81 cases and 324 controls, matched on sex and year of birth and found no association with the educational status of victims. Galea et al. (2003) applied a multi-level case–control study including 725 accidental overdose deaths

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(cases) and 453 accidental deaths due to other causes (controls) in various neighbourhoods in New York City. Their results showed increased odds of dying from overdose in neighbourhoods with unequal income distribution.

Social and economic conditions shape risk behaviours and the health of drug users as they impact on drug use patterns and affect the availability of resources and access to social welfare systems (Galea & Vlahov, 2002). Nonetheless, fatal overdoses are avoidable to a large extend (Sporer, 2003). Our objective is to assess the impact social and economic parameters may have on the occurrence of fatal overdoses caused by the use of illicit drugs. Our findings should thus contribute to improve knowledge on the pathways that may lead to overdose incidents and to reduce their occurrence and consequences by implementing evidence-based public health and social policies.

Overall characteristics of national fatal overdose victims as well as differences in risk factors according to gender were described previously (Origer, Lopes da Costa, & Baumann, 2013). As far as problem drug use is concerned, injecting heroin associated to polydrug use is the predominant consumption pattern observed nationally. Free outpatient and reimbursed inpatient and substitution treatment options are available throughout the country and, since 2005, a supervised drug consumption room is being operational in Luxembourg-City besides harm reduction services implemented regionally.

Methods

Case definition, study design and participants

In the present study, a fatal overdose case is defined as an intentional or unintentional death for which an acute adverse reaction after the recent use of products containing opioids and/or cocaine is reported as the primary cause of death in the light of toxicological and forensic evidence. Concomitant use of other substances is not an exclusion criterion if the use of opioids and/or cocaine is reported as the primary cause of death by national forensic authorities.

A nested case–control study design was chosen. Cases are defined as victims of a fatal overdose having occurred in Luxembourg between 1994 and 2011. Matched controls refer to persons indexed by the epidemiological surveillance system on drug users in contact with national services (RELIS). Cases were matched with four controls, on sex, year of birth, drug administration route and duration of drug use. Previous research has shown that matching more than four controls with each case does not significantly add statistical power to the analysis (Cai & Zheng, 2012; Ury, 1975). Controls were never matched to more than one case and deceased users were excluded from the RELIS database in order to avoid that they were matched with cases.

Matching variables are defined as follows:

- *Sex* (male, female).
- *Year of birth* (in case no perfect match was available, a difference of one year more or less between the case and controls was accepted).
- *Route of administration* (injecting drug use, non-injecting drug use).
- *Duration of illicit drug use* (matching according to duration of drug use is an essential condition to avoid the selection bias of selective survival. Risk exposure parameters of cases and controls were set to be comparable and in case no perfect match could be found, controls with the closest duration of drug use were chosen).

Data sources

The following data sources have been cross-examined in order to complete victims' profiles, drug use patterns and life histories:

Drug misuse surveillance data

The national drug monitoring system (RELIS) is operated by the Luxembourg focal point of the European Monitoring Centre on Drugs and Drug Addiction (EMCDDA) and indexes drug-related contacts with both, drug demand and drug supply reduction institutions in a single and integrated database. The RELIS network includes all national psychiatric departments of general hospitals, specialised in- and outpatient drug care services including substitution treatment offers, harm reduction services, prisons and special drug law enforcement agencies.

Indexed drug users are digitally anonymised by means of an encryption algorithm approved by the National Commission on Data Protection. The thus obtained unique attribution code allows respondents' recognition within single and between multiple data sources. The RELIS data protocol includes routine items on socio-demographics, educational, socioeconomic and health status, drug use histories and patterns, treatment records and contacts with the penal system.

Forensic evidence

In case of a suspicious death case, the public prosecutor's office orders a toxicological investigation and an autopsy of the victim. The forensic department of the National Laboratory of Health (LNH) reports drug-related death cases also to the Ministry of Health for public health surveillance and statistical purposes. Forensic reports contain data on substances detected in the victims, physical aspects as well as an assessment of the association of detected substances and the occurrence of death. Autopsy reports also contain contextual information and elements of life history. Toxicological reports have been anonymised and made available to the research team by LNH, following the authorisation of the Public Prosecutors Office.

National law enforcement records of fatal overdose cases

National judicial police authorities exhaustively list overdose deaths occurring on the national territory after forensic confirmation. Toxicological evidence and related police reports are compiled for each case.

Cross examination of data sources was possible as RELIS codes have been calculated and attributed to all overdose victims, previously de-identified. Since persons included in the national RELIS database or in the police overdose record are anonymised by the same coding routine, matching cases could be reliably detected. Furthermore, toxicological and autopsy reports were attributed to respective cases by using date of birth and date of death of victims.

Statistical methods

In order to account for missing values, we performed multiple imputation using the fully conditional specification approach (van Buuren, 2007) on the entire data set and generated 10 imputation data sets. Statistical tests were performed on both, original data (with missing values) and imputed data sets in order to assess the extent to which results converge.

Conditional logistic regression analysis, as recommended for case–control data sets (Breslow & Day, 1980; Langholz & Goldstein, 2001), was performed on the entire study sample in order to assess the respective impact of the following explanatory variables on the occurrence of fatal overdoses: