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Research paper

Assessing gender disparities in excess mortality of heroin or cocaine users compared to the general population

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ABSTRACT

Background: Previous analyses of excess mortality in drug users compared with the general population have almost always been based on mortality ratios, reporting much higher figures in women than men. This study tests the hypothesis that being a heroin or cocaine user adds more death risk in women than men in Spain.

Methods: A retrospective cohort of 15,305 heroin users (HUs) and 11,905 cocaine users (CUs) aged 15–49 starting drug treatment in 1997–2007 was recruited in Spain and followed until December 2008 to determine vital status and cause of death. Excess mortality in men and women compared to the general population was assessed with directly age-standardized rate ratios (SRRs) and differences (SRDs).

Results: SRR was significantly higher in women than men for all causes (14.7 vs. 9.4), natural causes (8.7 vs. 6.2), overdose (331.6 vs. 163.9) and other external causes (46.9 vs. 11.8) among HUs; and for overdose (170.8 vs. 40.5) and other external causes (21.0 vs. 4.7) among CUs. However, the opposite happened with SRD for all causes (1294 vs. 1845 deaths/100,000 person-years), natural causes (675 vs. 1016 deaths/100,000 person-years) and overdose (331 vs. 619 deaths/100,000 person-years) among HUs, while no significant SRD gender disparities were observed among CUs.

Conclusion: Compared with the general population, being a heroin user adds greater absolute risk in men than women, but this does not happen with cocaine users. Similar results would likely have been found in most published cohort studies if this indicator had been used; the exclusive use of relative indices of disparity as in previous meta-analysis can be extremely misleading.

Introduction

The measurement of disparities between user subgroups (i.e., men vs. women) regarding the death risk added by being a heroin or cocaine user is essential to estimate differential needs for intervention in those subgroups. In population mortality registers, heroin or cocaine-induced mortality (drug overdose) is usually consistently higher in men than women, with men/women rate ratios of 4 or higher (Corkery, 2012; Darke, Kaye, & Duflou, 2005; EMCDDA, 2006, 2013; Rudd et al., 2014; Warner-Smith, Darke, Lynskey, & Hall, 2001). However, this comparison refers to a single cause of death. Moreover, it could largely reflect gender disparities in the population prevalence of heroin or cocaine use (EMCDDA, 2007, 2015; SAMHSA, 2014). In the absence of representative cohorts of the general population, including a sufficient number of heroin or cocaine users, gender disparities in mortality risk added by the exposure (heroin or cocaine use or closely related factors)

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should be assessed both in cohorts of drug users and the general population (assuming that the latter primarily represents the risk of non-drug users). In recent meta-analyses of these cohorts, the crude mortality rate ratio for men versus women was 1.29 for all causes and 1.75 for overdose among heroin users (Degenhardt, Bucello et al., 2011), and 1.32 and 1.38, respectively, among injectors (mostly heroin users) (Mathers et al., 2013), with no reliable data available for cocaine users (Degenhardt, Singleton et al., 2011). However, the single strategy of comparing death risk between genders within the cohort fails to clarify whether the above mentioned exposure adds a higher death risk in women than men because a similar gender disparity in mortality could exist among non-drug users.

To clarify this, it is necessary to calculate excess mortality in drug users compared with non-drug users in both men and women and then to compare such excess between the two genders. For this purpose, the general population — as a control group representing non-drug users — and the standardized mortality ratio (SMR) — as a measure of excess mortality — have commonly been used. The aforementioned meta-analyses found a pooled male/female SMR of 0.58 for both heroin users and injectors (Degenhardt, Bucello et al., 2011; Mathers et al., 2013), while no reliable data were available for cocaine users (Degenhardt, Singleton et al., 2011). Based on these findings, the authors stated that the pooled SMR "suggests that females had significantly greater excess mortality than males in similar age groups in the general population" (Mathers et al., 2013). However, it is foolhardy to draw this conclusion using only theSMR. First, it is a measure of relative disparity, which expresses the disparity as a dimensionless ratio and thus does not capture information on background mortality risk in the general population. As the mortality risk in young adults from the general population is much lower in women than in men (Regidor, Gutiérrez-Fisac, & Alfaro, 2011), adding an absolute risk of dying of similar magnitude in men and women drug users, the SMR tends to be much higher in women than in men. Therefore, using only relative measures of disparity (a widespread problem in health inequality research (Harper & Lynch, 2000; King, Harper, & Young, 2012) could lead to a completely misleading assessment of the differential effects and intervention needs in the subgroups compared (e.g., men and women). Moreover, the SMR is a ratio of indirectly age-standardized rates, which is appropriate for comparison of the mortality in each cohort subgroup (i.e., men or women) with the corresponding subgroup in the standard population, but the usual gender comparisons based on SMRs (Degenhardt, Bucello et al., 2011; Mathers et al., 2013) are risky, because they could be distorted by gender disparities in the age structure within the cohort (Pickle & White, 1995; Rothman, Greenland, & Lash, 2008).

However, very few cohort studies of heroin or cocaine users have directly calculated age-standardized mortality rates for men and women (Antolini, Pirani, Morandi, & Sorio, 2006; Bargagli, Sperati, Davoli, Forastiere, & Perucci, 2001; Lejckova & Mravcik, 2007), and none have estimated the absolute excess mortality compared to non-drug users, or have provided data to estimate this excess.

Using both relative and absolute measures of excess mortality, we aim to test the hypothesis that being a heroin or cocaine user adds a higher risk of death (higher excess mortality) in women than in men, by assessing gender disparities in all-cause and leading cause-specific mortality among heroin or cocaine users admitted to drug treatment in Madrid and Barcelona during 1997–2008.

Methods

A retrospective cohort study was carried out. Details on recruitment, baseline assessment and follow-up have been described previously (de la Fuente et al., 2014).

Participants

The study included 15,305 heroin users (HUs) (12,157 men and 3148 women) and 11,905 cocaine users (CUs) (9875 men and 2030 women) aged 15–49 who started drug treatment in 1997–2007, although they may have started another drug treatment before. Recruitment was carried out in outpatient centres that provided care free of charge in the cities of Madrid and Barcelona, Spain. All HUs were using heroin when starting treatment, regardless of whether they were also using cocaine, while CUs were using cocaine but not heroin. The criterion for heroin (or cocaine) use was having been admitted to treatment to control the use of such drug or evidence from clinical records of having used it within 30 days prior to treatment admission.

Baseline assessment

An individual record was completed when starting treatment, including recruitment date, personal identifier (first name, surname, birthdate and sex), socio-demographic variables (age, education, and employment), and drug use variables (lifetime drug injection, and frequency and length of cocaine and heroin use). Baseline measurements referred to time of treatment admission or the previous 30 days. Missing values were less than 4% for all variables. Data were stored in two databases on separate computers, one containing identifiers, and another the study variables, and later linked with a meaningless code.

Follow-up and assignment of cause of death

The follow-up ended on 31-12-2008. Vital status, date and underlying cause of death were obtained through record linkage with the Spanish General Mortality Register using the personal identifier. All individuals who were not identified as dead were considered to be alive at the end of follow-up. It is estimated that during follow-up 0.2% of the general population aged 15–59 emigrated abroad (INE, 2012). The cause of death initially assigned was the General Mortality Register underlying cause coded according to the International Classification of Diseases, ninth revision (ICD-9) for 1997–1998 and ICD-10 for 1999–2008. Some codes from the chapter of mental or behavioural disorders (291, 292 and 303-305 in ICD-9, and F10-F19 and F55 in ICD-10) were considered as unintentional poisoning (overdose), following recommendations of European institutions (EMCDDA, 2010). However, since in Spain the General Mortality Register coding of external causes, especially overdose, has limitations (Santos et al., 2010), in Barcelona the forensic and toxicological register was also consulted, assigning the cause from the latter register to discrepant cases. This could not be done in Madrid, but some non-specific codes (427.5, 514, 518.4, 780-799 and 980 from ICD-9, and I46, J81, J96, R00-R74 and R76-R79 from ICD-10) were included as overdose in HUs and CUs because the consultation in Barcelona had shown that they contained mostly deaths from this cause. Confidentiality was warranted during linkages.

Statistical analysis

Causes of death were grouped into broader categories, mainly infectious/parasitic diseases (infection), other natural causes, overdose, and other external causes (Randall, Roxburgh, Gibson, & Degenhardt, 2009). The codes included in each category are shown as Supplementary material (Table S1). Proportional mortality and crude mortality rates (CMRs) by sex were computed separately for HUs and CUs. CMRs were expressed per 100,000 person-years of follow-up (py) using the dynamic method of allocation of py and deaths to age categories. Each subject