Estimating the prevalence of drug injection using a multiplier method based on a register of new HIV diagnoses

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Knowledge of prevalence of illegal drug injection can aid the design and evaluation of services for problem drug users. In this study, prevalence of recent injectors in Spain was estimated with a multiplier method using the number of injectors in a population register of new HIV diagnoses, HIV incidence among injectors from cohort studies and HIV prevalence among injectors in a drug treatment register. Prevalence in 2008 was 38.8 (95% CI 23.8–53.8) per 100 000 population, a 2.8 times reduction compared with 2001. This method permits estimation of both prevalence and trends of drug injection. It is sustainable and routinely applicable in many countries.

Keywords: drug injection, estimation, multiple method, prevalence, Spain

Introduction

Illegal drug injection is an important public health problem in many countries, mainly because of its role in contributing to blood-borne infections and fatal overdoses. However, the development and evaluation of services to reduce its impact is hampered by the dearth of valid estimates of the number of illegal drug injectors (DI) in the population. Population surveys greatly underestimate this prevalence, thus it is necessary to resort to indirect statistical methods. Capture-recapture methods generally produce good estimates, but they require nominal linkage of various registers, and implementing them at national or regional level is often problematic. One alternative is to apply a multiplier method using several sources, for example, estimating the number of drug injectors by multiplying the number of problem opiate drug users by the proportion of those who are drug injectors. This method was used to obtain the only estimate available for Spain: 83 972 recent injectors (312 per 100 000 population aged 15–64 years) in 1998. It is possible, however, to use a multiplicative method with benchmarks from other population registers, for example, the register of new HIV diagnoses.

Methods

Estimation of drug injection prevalence

The Spanish register of new HIV diagnoses covered an area of 12.1–14.2 million inhabitants (29.6–32.1% of the Spanish population) in 2001–08. The number of drug injectors in this area in the reference year was estimated as the sum of the number of HIV negative drug injectors (NDI) and HIV positive DI. NDI was obtained with the algorithm NDI = x/y, where x is the adjusted number of new HIV diagnoses related to drug injection notified to the HIV register, and y is the annual incidence rate of HIV among injectors. This algorithm can be derived from the formula for HIV incidence in a population of drug injectors at risk of this infection (y = x/NDI). To obtain x, the number notified to the HIV register was previously adjusted for underreporting (multiplying by a factor of 1.20, as proposed by those who administer the register), for drug users not tested for HIV (multiplying by an annual factor of 1.16–1.22, provided by the treatment demand indicator (TDI)), and for delayed reporting (multiplying by a factor of 1.12 in 2006, 1.21 in 2007 and 1.35 in 2008; estimations based on reports to the HIV register itself). For its part, y was obtained by pooling data from two cohort studies of HIV negative drug injectors. The first cohort study included 686 participants recruited in a Centre for Information and AIDS Prevention (CIPS) in Valencia and followed up during 2001–05, and the second one included 474 street-recruited participants in the Itinere Project in Madrid, Barcelona and Seville and followed up during 2001–06. The two studies combined provided 1224 years of follow-up, 47 new HIV infections and a rate of 0.0384 HIV infections per injector-year of follow-up.

PDI was obtained by the algorithm PDI = (p*NDI)/(1–p), where p is the prevalence of HIV infection among drug
The prevalence of drug injection in all of Spain was assumed to be the same as in the area with the HIV register.

For the estimation of confidence intervals of NDI, PDI and DI, the normal approximation with estimate of a standard error was used. The final variance was obtained with general formulas based on Taylor series approximations to estimate the variance of a ratio, a product or a linear function of estimators of random variables. In this case, the final variance depends greatly on the variance of the HIV incidence rate in the cohort studies of drug injectors, which is a Poisson variable (number of drug injectors divided by a constant (population)). The confidence intervals of the estimators for all of Spain were obtained by a substitution method. This is the first time that such a method has been used to estimate the prevalence of drug injection in Spain. To our knowledge, the prevalence of drug injection in Spain on the assumption that the prevalence of drug injection in the whole of Spain was the same.

**Estimation of confidence intervals of the estimators**

To obtain confidence intervals of NDI, PDI and DI, the normal approximation with estimate of a standard error was used. The final variance was obtained with general formulas based on Taylor series approximations to estimate the variance of a ratio, a product or a linear function of estimators of random variables. In this case, the final variance depends greatly on the variance of the HIV incidence rate in the cohort studies of drug injectors, which is a Poisson variable (number of drug injectors divided by a constant (population)). The confidence intervals of the estimators for all of Spain were obtained by a substitution method.

**Results**

In 2008, the rate of new HIV diagnoses related to drug injection in the area monitored by the HIV register in Spain was 2.8 times lower (3.1 times) than among NDI (2.7 times). The results were extrapolated to all of Spain on the assumption that the prevalence of drug injection in areas with and without the HIV register was the same.

**Discussion**

In this work, we used a simple multiplicative method based on two routine administrative registers (register of new HIV diagnoses and register of drug treatment) together with HIV incidence among drug injectors in cohort studies to estimate the prevalence of drug injection in Spain. To our knowledge, this is the first time that such a method has been used to estimate the prevalence of drug injection. The results are credible and consistent. In fact, they show a decreasing trend in the prevalence of drug injection similar to TDI, where the number of drug injectors decreased by 2.3 times between 2001 and 2007 versus 2.5 times in our estimate. Furthermore, if the prevalence of drug injection for 1998 is estimated assuming the same ratio between total DI and number of drug injectors in TDI as calculated for 2001–07 (4.69), a figure of 88 147 is obtained, which is very similar to the number estimated by a multiplier method using other sources.

Beyond the comparison with estimates obtained with other methods, it is not possible to test the validity of our results. The method makes some assumptions that may not be entirely met. For example, an annual incidence rate of HIV infection of 3.8% among drug injectors was applied to the entire period 2001–08. However, the rate may have been lower in more recent years, which would result in a certain underestimation of the prevalence of injection for those years. Moreover, this incidence rate was derived from two cohorts, which may not be fully representative of all Spanish injectors. The prevalence of HIV infection among injectors was taken from the TDI indicator; however, drug injectors in methadone maintenance treatment are a captive population who, if still injecting, may have a higher HIV prevalence, which would result in a slight underestimation of the prevalence of drug injection. The number of injectors throughout Spain was estimated assuming that the prevalence of injection in the whole country was the same as in the areas with the HIV register. However, in TDI in 2006–07, the prevalence of injection in areas with the HIV register was 1.19 greater than in Spain overall, which would give rise to an overestimation of the prevalence in the whole country. Moreover, some of new HIV diagnoses in population register probably were not recent HIV infections.

Various methods have been proposed to obtain estimates of the prevalence of drug injection, but few of them have been used consistently over periods of several years to obtain trends. Despite the above mentioned limitations, this simple method has made it possible to calculate timely, current trends that can continue to be obtained in the future. The method seems to be sustainable assuming availability of a population register of new HIV diagnoses, together with estimations of HIV incidence and prevalence among DI. Thus, this method could be used in many countries, especially...
in those with high rates of HIV incidence and prevalence among drug injectors.

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**Conflicts of interest:** None declared.

### Key points

- It is estimated that there were 38.8 (95% CI 23.8–53.8) recent drug injectors per 100,000 population in Spain in 2008.
- The prevalence of drug injection in Spain in 2008 was 2.8 times lower than in 2001.
- Consistent and credible prevalence estimates of drug injection can be obtained using multiplier methods based on routine administrative registers and HIV incidence data from cohort studies.

### References