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Years of potential life lost amongst heroin users in the Australian Treatment Outcome Study cohort, 2001–2015

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ABSTRACT

Background: Heroin use carries the highest burden of disease of any drug of dependence. The study aimed to determine mortality rates of the Australian Treatment Outcome Study cohort over the period 2001–2015, and the years of potential life lost (YPLL).
Methods: The cohort consisted of 615 heroin users. Crude mortality rates per 1000 person years (PY) and Standardised Mortality Ratios (SMR) were calculated. YPLL were calculated using two criteria: years lost prior to age 65, and years lost prior to average life expectancy.
Results: The cohort was followed for 7,790.9 PY. At 2015, 72 (11.7%) of the cohort were deceased, with a crude mortality rate of 9.2 per 1000 PYs. Neither age nor gender associated with mortality. The SMR was 10.2 (males 7.3, females 17.2), matched for age, gender and year of death. The most common mortality cause was opioid overdose (52.8%). Using the <65 years criterion, there were 1988.3 YPLL, with a mean of 27.6 (males 27.6, females 27.7). Using the average life expectancy criterion, there were 3135.1 YPLL, with a mean of 43.5 (males 41.9, females 46.3). Accidental overdose (<65yr 63.0%, average life expectancy 63.7%) and suicide (<65yr 12.8%, average life expectancy 13.3%) accounted for three quarters of YPLL where cause of death was known.
Conclusions: YPLL associated with heroin use was a quarter of a century, or close to half a century, depending on the criteria used. Given the prominent role of overdose and suicide, the majority of these fatalities, and the associated YPLL, appear preventable.

1. Introduction

Heroin use carries the highest burden of disease of any drug of dependence, with rates of mortality more typical of the elderly (Bird, 2010; Darke et al., 2011; Degenhardt et al., 2011, 2013; Jimenez-Trevino et al., 2011; Lopez-Quintero et al., 2015; Pierce et al., 2015; Smyth et al., 2007; Stenbacka et al., 2010). Indeed, it has been estimated that heroin users die at a rate 15 times that of the general population (Degenhardt et al., 2011). Reflecting the high levels of mortality risk factors seen amongst heroin users, rates of death are elevated for all causes, including overdose, suicide, disease, trauma and homicide.

While mortality rates provide important epidemiological data, they do not measure the extent of premature mortality. One measure of premature mortality that does attempt to measure the impact of premature death is years of potential life lost (YPLL; CDC, 1990; Degenhardt et al., 2013; Gardner and Sanborn, 1990; Laursen et al., 2013; Nordentoft et al., 2013; Smyth et al., 2007; Wahlbeck et al., 2011). The method employed by the Centers for Disease Control and Prevention (CDC) for calculating YPLL is the criterion of years of life lost prior to age 65 (CDC, 1990). A death at age 25, for instance, would yield a YPLL of 40. An alternative measure is to operationalize YPLL as years lost prior to the average life expectancy of the general population (Degenhardt et al., 2013; Laursen et al., 2013; Nordentoft et al., 2013; Wahlbeck et al., 2011). Whichever method is used, deaths at younger ages carry more weight in terms of YPLL than those that occur at older ages, providing a measure of premature mortality associated with the condition.

While there are considerable data on YPLL for psychiatric and other diseases (Burnet et al., 2005; Guy and Ekwueme, 2011; Jang et al., 2014; Laursen et al., 2013; Nordentoft et al., 2013; Wahlbeck et al., 2011; Werber et al., 2013), there are few estimates for heroin use (Degenhardt et al., 2013; Smyth et al., 2007). Those that have

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been conducted indicate a very high incidence of premature death. Using the CDC criterion, Smyth et al. (2007) estimated an average of 18 YPLL over the period 1962–1997 amongst male heroin user fatalities in the California Civil Addict Program. A substantially higher figure of 29 years in the period 1985–2005 was reported by Degenhardt et al. (2013) for Australian opioid substitution patients, this figure rising to 44 years using an average life expectancy criterion. By means of comparison, average life expectancies of patients with major psychiatric disorders are in the order of 15–20 years shorter than the general population, while cancers are associated with 5–20 years reduced life expectancy (Burnet et al., 2005; Jang et al., 2014; Laursen et al., 2013; Nordentoft et al., 2013; Wahlbeck et al., 2011; Werber et al., 2013).

The Australian Treatment Outcome Study (ATOS) cohort, recruited in 2001–2002, provides a means of assessing long-term mortality and YPLL amongst a cohort of heroin users who were recruited from multiple treatment modalities (Ross et al., 2005). The cohort has exhibited substantial clinical improvement over time (Ross et al., 2006; Teesson et al., 2006, 2008, 2015). Typical of the chronicity of heroin use, however, cycles of abstinence and relapse were common. At the most recent follow-up (11 years post-baseline), half were enrolled in a treatment programme for heroin dependence, a quarter had recently used heroin, and only 6% had maintained heroin abstinence across follow-up (Darke et al., 2015b; Teesson et al., 2015). Moreover, overdoses were still occurring, rates of attempted suicide remained elevated, levels of psychopathology remained high and physical health was declining (Darke et al., 2014, 2015a, 2015b,c; Teesson et al., 2015). In earlier work we examined mortality rates amongst the cohort at 2009, which, while high, were lower than reported elsewhere (Darke et al., 2011). Five percent were deceased, with an annual mortality rate of 0.6%, 4 and a half times the general population rate.

The data from the 11-year follow-up indicate that large proportions of the surviving cohort remained at high risk of premature mortality, due to factors such as overdose and suicide. In this work we examine mortality and YPLL amongst the ATOS cohort across the period 2001–2015. For those surviving at 2015, this represents approximately 25 years since their initial heroin use. Specifically, the current study aimed to:

1 Determine mortality rates of the ATOS cohort over the period 2001–2015; and

2. Determine the YPLL of the ATOS cohort, using both CDC and average life expectancy criteria for calculating YPLL.

2. Materials and methods

2.1. Procedure

The data were collected from the New South Wales component of ATOS. Baseline interviews were conducted between February 2001 and August 2002. ATOS is a longitudinal study of heroin users recruited from randomly selected treatment agencies delivering methadone/buprenorphine maintenance treatment (n = 201), drug free residential rehabilitation (n = 133) or detoxification (n = 201). Subjects were recruited from 19 agencies treating heroin dependence in the greater Sydney region, randomly selected from within treatment modality. In addition, 80 heroin users not currently in treatment were recruited from needle and syringe programs. Participants were interviewed at baseline, 3-months (89% followed-up), 1-year (80%), 2-years (76%), 3-years (70%) and 11-years (70%). Eligibility criteria at baseline were: (i) no treatment for heroin dependence in the preceding month, (ii) no imprisonment in the preceding month, (iii) agreed to give contact details for follow-up interviews, (iv) aged ≥18 years, and (v) fluent in English. Subjects were paid A$40 for completion of the 11 year interview, and A$20 for earlier waves. Ethical approval was given by the University of New South Wales, all relevant area health services, and from the Australian Institute of Health and Welfare for accessing death details. The work was carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans.

Deaths, and cause of death, were confirmed through the National Death Index (NDI), a statutory register of all deaths in Australia administered by the Australian Institute of Health and Welfare. The search was conducted in July, 2015, and details of deaths that had occurred amongst participants since 2001 obtained. Participants were matched by full name, gender and date of birth. Cause of death was grouped into the following categories: accidental overdose, disease, suicide and traumatic accident. There were no homicides amongst the cohort. It should be noted that there is an approximately two year delay from death registration to coding of the cause of death into the NDI.

2.2. Structured interviews

Prior to each interview, informed consent was obtained, and all obtained information was confidential. At each wave, participants were administered a structured interview that addressed demographics, treatment history, drug use, heroin overdose, needle sharing, current health, psychological distress, and criminal behaviors in the preceding month. Drug use and crime over the month preceding interview was measured using the Opiate Treatment Index (OTI; Darke et al., 1992). General mental and physical health were measured using the Short-Form 12 (SF12; Ware et al., 1996). ICD-10 screens for Borderline Personality Disorder (BPD) were obtained using the International Personality Disorder Examination Questionnaire (Slade et al., 1998). Diagnostic and Statistical Manual (4th edition) diagnoses of Major Depression and Posttraumatic Stress Disorder (PTSD) were obtained using the Composite International Diagnostic Instrument (CIDI) version 2.1, as were suicide attempts (World Health Organization, 1998). DSM-IV diagnoses of Antisocial Personality Disorder (ASPD) were obtained using a modified version of the Diagnostic Interview Schedule (Robins et al., 1981).

2.3. Statistical analyses

Means and standard deviations were reported for continuous variables, and one-way ANOVAs conducted for comparisons of means. Chi square was used for gender comparison of cause of death proportions. Person years (PY) of follow-up were calculated, as were crude mortality rates per 1000 person years (PY) with 95% confidence intervals (CI). Standardised Mortality Ratios (SMR) were calculated by reference to age specific death rates in the Australian population (Australian Bureau of Statistics, 2015). Cox proportional hazards regressions were performed to determine Hazard Ratios (HR) for major baseline characteristics.

YPLL were calculated using two criteria. In the first set of analyses, YPLL were calculated for each fatality using CDC criteria (CDC, 1990), i.e., 65 years minus age at the time of death. In the second set of analyses, YPLL were calculated subtracting age at time of death from the average life expectancy of the Australian population, specified for gender and the year in which the death occurred (Australian Bureau of Statistics, 2015). All analyses were conducted using IBM SPSS Statistics 22.0 (IBM SPSS Inc., 2013).