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# The economic cost of heroin dependency and quality of life among heroin users in Taiwan



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## ABSTRACT

Heroin dependence may cause an economic burden and has an impact on quality of life (QOL). However, assessments of economic cost are scarce and the relationship between economic cost and QOL is unclear in the Asian population. In the present study, an established questionnaire was modified to assess the economic cost and its association with QOL. A total of 121 volunteer subjects in a methadone maintenance therapy programme and 157 normal controls were enrolled. The total economic cost of heroin dependency is US\$ 18,310 per person-year. The direct cost is US\$ 11,791 per person-year (64% of the total cost), mostly consisting of the cost of heroin and other illegal drugs. The indirect cost is US\$ 6519 (36% of the total cost) per person-year, most of which arises from productivity loss caused by unemployment and incarceration. The QOL of heroin-dependent patients is poorer than that of healthy controls in all domains. The overall QOL is negatively related to direct cost and total cost. The economic cost of heroin dependency is huge, equal to 1.07 times the average gross domestic product per capita. Reduction of the economic cost to society and the economic burden for heroin users is important.

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## 1. Introduction

Heroin and other substance abuse may cause an economic burden on individual users and an economic cost to society to a greater degree than other mental disorders (Rice et al., 1991; Rice, 1999). It is well known that opioid dependency is co-morbid with infectious diseases due to needle sharing, such as the human immunodeficiency virus (HIV), hepatitis C virus (HCV) and hepatitis B virus (HBV) (Gyarmathy et al., 2002; Shapatava et al., 2006; Chu et al., 2009), and psychiatric illness (Darke and Ross, 1997; Callaly et al., 2001). Physical and mental disorders due to illicit heroin use may increase the medical cost. However, the direct medical cost may only be a small proportion of the total cost of heroin dependency. For example, it has been found that the medical cost (23% of the total cost) is smaller than the productivity loss (53% of the total cost) caused by heroin dependency (Mark et al., 2001) and it is also known that the social cost related to criminal behaviour forms a large proportion of the total estimated cost (78%) of drug abuse (Healey et al., 1998).

Expenditure on opioids may be another heavy burden on heroin users. An income and expenditure analysis (Roddy and Greenwald, 2009) revealed that 72% of the income of heroin users is allocated to heroin purchases, while only 7% is spent on food and 5% on shelter and utilities. The cost of illegal opioid acquisition may constitute a huge direct cost and a large burden on illicit opioid abusers, which may induce criminal activity as an income-generating behaviour (Bretteville-Jensen and Sutton, 1996; Hutchinson et al., 2000). As heroin may be one of the most costly drugs (Golub and Johnson, 2004), expenditure on illicit drugs could be considered an important proportion of the direct cost of heroin dependency.

It has been reported that the total economic cost in the USA was US\$ 21.9 billion per year (Mark et al., 2001) and that in Taiwan it was US\$ 0.31 billion in 1996 (Yu et al., 1998). These results indicate that the economic cost of heroin is approximately US\$83 per capita, 0.29% of the gross domestic product (GDP) per capita, in the USA and US\$ 15 per capita, 0.11% GDP per capita, in Taiwan. The economic cost of heroin use per capita in the USA and Taiwan is comparable to the estimated economic cost of illicit drugs in Canada, at 0.20% GDP per capita (Single et al., 1996). It has also been found that the social cost, including cost due to criminal behaviour, amounted to over £12 million for illegal drug users in the UK (Healey et al., 1998). Although these studies focussed on different domains of economic cost, the evidence

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suggests that the economic cost of heroin dependency comprises not only medical cost, but also other aspects of cost, such as productivity loss, social cost and expenditure on heroin. It is suggested that gaining an understanding of the complex aspects of the economic cost of heroin abuse is vital for the evaluation of treatment (Vanagas et al., 2006). However, most studies have been based on the analysis of secondary data; little is known regarding the economic cost to each user from first-hand data.

First-hand data analysis of economic cost may provide additional valuable information. First, the benefit of first-hand data analysis is the simultaneous collection of direct cost and indirect cost data for the same individual, giving a whole picture. Therefore, it becomes more reasonable to compare the ratio of impact for different cost impacts for each patient. Second, it is well known that quality of life (QOL) is an important index of psychosocial function. The subjective QOL of each participant needs to be assessed. Although it has been documented that the prevalence of heroin and other opioid use is highest (2%) in Southeast and Southwest Asia (Van der Burgh, 1999), only a small proportion of the economic studies on opioid use have been conducted in East-Asian countries (Yu et al., 1998).

Meanwhile, opioid use also correlates with/impairs a wide range of psychosocial variables, such as personality (Gerra et al., 2008) and social network (Buchanan and Latkin, 2008). QOL, which may refer to a subjective evaluation of the general well-being of individuals, could be a valuable outcome for clinicians. A wide array of generic indicators of health-related QOL, such as the World Health Organization Quality of Life-Brief Version (WHOQOL-BREF), EQ-5D and Short Form (36) Health Survey (SF-36), has been developed for medical studies in Western society (Cieza and Stucki, 2005). It should be noted that, until recently, QOL had not been studied in Chinese and other Eastern societies (Inoguchi and Fujii, 2009; Shek, 2010), but it was recently extended from medical settings to other areas, such as economic and social disadvantages (Shek, 2011). The WHOQOL-BREF, which was developed for cross-cultural study, could be one of the most popular and sound instruments for use in Taiwan (Yao et al., 2002; Wang et al., 2006). It has also been proposed that the WHOQOL-BREF could be a suitable instrument for assessing the global QOL, while the SF-36 reflects the health-related QOL (Huang et al., 2006). The WHOQOL-BREF has been also proposed as a suitable instrument for research on addiction behaviour (Laudet, 2011). Additionally, the QOL of heroin abusers is poorer than that of normal controls (Fassino et al., 2004; Astals et al., 2008; De Maeyer et al., 2010), and QOL is considered an important outcome reflecting the cost benefit of treatment for heroin dependency (Barnett, 1999). A recent study in Taiwan using the WHOQOL-BREF demonstrated that recovery of QOL is associated with treatment for heroin dependency (Wang et al., 2012). However, the association between economic cost and QOL among heroin-dependent subjects is as yet unclear.

The aim of this study was to explore the economic cost of heroin use and the QOL of heroin users in Taiwan. In the present study, we modified an established assessment tool (Ko et al., 2003; Yeh et al., 2003; Lee et al., 2008) used to estimate the cost of illness of psychiatric illnesses to examine the economic cost of heroin dependency, in order to assess the QOL of heroin users and its association with the economic cost of heroin use.

## 2. Method

### 2.1. Subjects

Volunteer patients in the methadone maintenance treatment (MMT) programme of the study site, National Cheng Kung University Hospital, Taiwan, were enrolled in the study. The MMT programme in Taiwan is sponsored by the government (local government and the Center for Disease Control, Taiwan). Heroin users who turn themselves in or are arrested by the police can be granted deferred prosecution and

receive methadone treatment. Heroin users who have been released from jail and still have an addiction to heroin are also encouraged to join this programme. HIV carriers with heroin dependence are also referred to join this programme. Currently, the MMT programme for treating heroin users is promoted by the government, and one of the main targets is to decrease the incidence of HIV infection. Meanwhile, the Department of Health and the Department of Police have an agreement to prohibit the arrest of heroin users near MMT programme clinics in Taiwan.

The inclusion criteria were as follows:

1. participants must fulfil the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (DSM-IV) criteria for opioid dependence and must be enrolled in an outpatient MMT programme,
2. participants must be aged between 18 and 65 years and
3. participants must have stable vital signs during enrolment.

Eligible outpatients with heroin dependency were enrolled by means of introduction to the study by research assistants. They had complete free will as to whether to participate in this study or not. Those who did not choose to participate in the study were not punished, maltreated or discriminated against and did not suffer any negative consequences. Those who joined the study received compensation of about 3.5 USD (above the minimum wage according to labour law regulations in Taiwan) for each hour. They had free choice as to whether to be interviewed before or after they received methadone. The Ethical Committee for Human Research at National Cheng Kung University Hospital approved the study protocol. All subjects signed an informed consent document indicating that they understood the purpose and procedures of the study.

A total of 121 heroin-dependent patients were enrolled. Most were male ( $N=108$ , 89.3%). Fifteen (12.4%) were diagnosed with HIV, but only four were under regular HIV treatment. Ten subjects (8.3%) had a history of methamphetamine use, among whom one had a history of marijuana use and one a history of ketamine use. The mean age was 39.30 (standard deviation (S.D.)=7.37) years, and the mean duration of heroin use was 13.18 (S.D.=6.35) years. Eight subjects (7.4%) were sponsored by the Centers of Disease Control, Taiwan, 11 subjects (9.1%) were receiving treatment in exchange for deferred prosecution and early release from jail, 47 subjects (38.8%) were sponsored by the local government, 27 subjects (22.2%) were partially sponsored by the government and 27 subjects (22.3%) did not receive sponsorship from the government.

A total of 157 healthy controls (age=31.55 ± 11.46 years, male=75, 47.8%) from the community surrounding the study site were enrolled and undertook the WHOQOL-BREF. We excluded individuals with mental illness as controls after an interview with a senior psychiatrist using the Chinese version of the Mini International Neuropsychiatry Interview (Sheehan et al., 1998). We also excluded participants with a history of physical illness, alcohol abuse or other substance abuse. The differences in sex and age between groups were significant and these were controlled as covariates in the group comparison.

### 2.2. Assessments

The patients were assessed using the following instruments when they visited the MMT clinic during the study period:

#### *Economic cost questionnaire for drug abuse*

We modified a questionnaire examining the cost of mental illness used in previous studies (Ko et al., 2003; Yeh et al., 2003; Lee et al., 2008) into a drug-abuse economic-cost questionnaire to investigate the medical utility, economic expense and cost of heroin use over the previous year. The original tool has been found to be valid for measurement of the cost of schizophrenia. It was found that the severity, type of antipsychotic medication and illness duration are correlated with direct cost, while the global and cognitive function of patients are associated with indirect cost (Ko et al., 2003; Lee et al., 2008). Expenditure on heroin, the part of this instrument used in the present study, was also found to be associated with central dopaminergic activity in a small-sample pilot study (Lin et al., 2011). This evidence supports the concurrent validity of this instrument. The recall period was a year before interview.<sup>1</sup> The direct and indirect costs were assessed as described below:

1. Direct costs: Medical costs were assessed by the recall frequency and the actual payments of patients for outpatient clinics, emergency services and inpatient treatment for heroin craving, HIV and other *co-morbidities*. Currently, most of the health-care costs in Taiwan are covered by the Bureau of National Health Insurance (BNHI), which is an organisation run by the government. More than 99.0% of the population was enrolled by 2009 (Bureau of National Health Insurance, 2011). The unit costs of the BNHI were used in the research

<sup>1</sup> The instrument is not listed here due to the length, and it is available upon request.

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