Original Article

# Factors associated with health-related quality of life among injection drug users at methadone clinics in Taipei, Taiwan

Yung-Feng Yen [a,b], Pesus Chou [b], Yu-Shiuan Lin [c], Chung-Yeh Deng [d,*]

[a] Section of Infectious Diseases, Taipei City Hospital, Taipei, Taiwan, ROC
[b] Community Medicine Research Center and Institute of Public Health, National Yang-Ming University, Taipei, Taiwan, ROC
[c] Department of Pharmacy, Taipei Veterans General Hospital, Taipei, Taiwan, ROC
[d] Institute of Hospital and Health Care Administration, National Yang-Ming University, Taipei, Taiwan, ROC

## Abstract

*Background*: Health-related quality of life (HRQOL) is widely used as an indicator of health status. However, few studies have examined predictors of HRQOL among injection drug users (IDUs). We investigated factors associated with HRQOL among IDUs in Taiwan.
*Methods*: In this cross-sectional study, recruited IDUs completed an HRQOL-related interview at methadone clinics in Taipei during 2012−2013. Multiple linear regression was used to identify factors associated with HRQOL.
*Results*: Of 802 eligible participants, 85.4% were male; mean (SD) age was 44.7 (8.7) years. Mean scores for physical, psychological, social, and environmental HRQOL were 13.2, 11.8, 12.5, and 12.5, respectively. In multivariate analysis, social support was significantly associated with better HRQOL in all domains ($\beta = 0.56, 0.87, 0.83$, and $0.64$, respectively), while obtaining most income from temporary jobs or other noncriminal sources was significantly associated with worse HRQOL in all domains ($\beta = -1.00, -1.03, -1.15$, and $-1.22$, respectively). Receiving methadone treatment was associated with good physical and psychological HRQOL ($\beta = 1.47$ and $0.79$, respectively), while history of drug overdose ($\beta = -0.40$ and $-0.53$, respectively), history of cutaneous abscess ($\beta = -0.45$ and $-0.53$, respectively), and human immunodeficiency virus (HIV) positivity ($\beta = -0.41$ and $-0.58$, respectively) were associated with lower physical and psychological HRQOL. Male sex ($\beta = -0.64$ and $-0.70$, respectively) and a greater number of incarcerations ($\beta = -0.11$ and $-0.12$, respectively) were associated with poor social and environmental HRQOL.
*Conclusion*: Poor HRQOL was associated with a number of factors among IDUs at methadone clinics in Taipei, Taiwan. To improve HRQOL in this population, future programs should focus on IDUs with a history of drug overdose. In addition, methadone programs and social support should be integrated to improve HRQOL among this socially marginalized population.
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*Keywords*: health-related quality of life; injection drug use; methadone; Taiwan

## 1. Introduction

There were approximately 15.9 million injection drug users (IDUs) globally in 2008.[1] Although methadone maintenance treatment programs (MMTPs) can prolong life and improve perception of general health among IDUs,[2] drug relapse is not uncommon while enrolled in treatment programs.[3] A prior study found that poor health-related quality of life (HRQOL) was associated with relapse of drug use among IDUs in an MMTP.[4] However, few studies have attempted to identify predictors of HRQOL among this vulnerable population.

HRQOL is often defined as "patients' functional status or quality of life affected by medical condition and/or consequent therapy".[5,6] As a self-reported measure of health status, it has

been used in a wide variety of health and clinical research for more than a decade.[7−9] However, to our knowledge, only two studies have examined factors associated with HRQOL among IDUs in an MMTP.[10,11] These studies used the Nottingham Health Profile[11] and the Medical Outcome Studies 36-item Short-Form Health Survey (SF-36)[10] to assess physical and psychological functions among drug users in MMTPs. They found that increased age[10] and human immunodeficiency virus (HIV) infection[11] were significantly associated with poor HRQOL, while higher education was significantly associated with good HRQOL.[11] However, Millson et al's[10] study was limited by the small number of participants.

Moreover, in measuring HRQOL, the Nottingham Health Profile and SF-36 are limited to certain health domains. The World Health Organization Quality of Life (WHOQOL) instrument was developed in 1991[12] and was revised as a shorter form of the WHOQOL-BREF instrument in 1998.[13] The WHOQOL-BREF instrument has been used widely and showed good sensitivity in evaluating HRQOL for a variety of diseases.[14,15] The WHOQOL-BREF instrument not only measures physical and psychological heath, which are evaluated by the Nottingham Health Profile and SF-36, but also social and environmental health.[12,13] Evaluation of social and environmental health is essential to determine the adherence to treatment in IDUs.[16] This study was aimed to investigate factors associated with HRQOL using the WHOQOL-BREF among IDUs in Taipei, Taiwan.

## 2. Methods

### 2.1. Study population and eligibility

This cross-sectional study consecutively recruited IDUs from Taipei City Hospital (TCH; Taipei, Taiwan) methadone clinics from March 2012 to April 2013. These clinics were established in 2007 and have now served approximately 90.6% of methadone clients in Taipei.[17] All clients are IDUs with a history of heroin addiction and are voluntarily enrolled in the program.[17] Each day they are required to report to methadone stands to receive free methadone therapy under direct supervision. Our study included methadone clients who were aged between 18 years and 64 years, had a history of injecting illicit drugs, and gave written consent. Clients with severe cognitive deficit (defined as Mini-Mental State Examination score ≤ 10 points)[18] were excluded from the study. Study participants who completed the survey were compensated with 300 New Taiwan Dollars (NTD; equivalent to US$10) for their time. This study was approved by the Institutional Review Board of TCH.

### 2.2. Data collection

At the time of study enrollment, consenting participants completed a face-to-face interview administered by trained case managers using a standardized questionnaire. The average duration of the interview was about 50 minutes. The case managers maintain a good rapport with the participants: they provide clients with methadone therapy, monitor their treatment complications daily, and promote adherence to treatment. The questionnaire collected information on participants' HRQOL, sociodemographics, substance use and injection practices, sexual behaviors, and social support.

The HRQOL of study participants was evaluated by using the WHOQOL-BREF, Taiwan version, which includes the 26 original items of the WHOQOL-BREF[13] plus two culture-specific items relevant to Taiwan.[19] One culture-specific item addressed "respect from others" and was included in the social domain; the other item corresponded to "eating what one likes to eat" and was included in the environmental domain. The method of administration, scoring procedures, and reference time period for the items (i.e., during the previous 2 weeks) were identical to those of the WHOQOL-BREF.[13] The test statistic for the reliability between the Taiwan version of the WHOQOL-BREF and the original measure ranged from 0.70 to 0.80, and Cronbach's α ranged from 0.70 to 0.77.[19,20] The Taiwan version of the WHOQOL-BREF measures four domains: physical capacity (7 items), psychological well-being (6 items), social relationship (4 items), and environmental health (9 items). All items are rated on a 5-point scale, with a higher score indicating higher HRQOL. In order to compare the scores among different HRQOL domains, each domain score, as suggested by a previous report,[14] was calculated by multiplying the average of the scores of all items in the domain by the same factor of 4. Therefore, each domain score has the same range, 4−20.

The sociodemographic characteristics studied included age, sex, education completed, marital status, body mass index (BMI), main source of income during the previous 6 months, housing status during the previous 6 months, history of methadone treatment, and history and frequency of incarceration. Marital status was classified as unmarried, married, divorced, or widowed. The information on education level was collected as uneducated, elementary school, high school, and university or higher. BMI (defined as $kg/m^2$) was categorized as underweight (< 18.5), healthy weight (18.5−24.9), or overweight (≥ 25).[21] The main source of income during the previous 6 months was categorized as (1) regular job (defined as full-time work; the reference category in statistical analysis), (2) temporary work or other noncriminal sources (i.e., informal or temporary work, panhandling, social assistance, or financial support from families or friends), or (3) criminal sources (i.e., theft, robbery, selling drugs, operating a drug injection location, and trading sex for money). Housing status was assessed by asking participants about the place in which they slept most often during the prior 6 months and was grouped into two broad categories: (1) stable housing (i.e., living in a family member's, partner's, friend's, or their own house or apartment—the reference category) and (2) unstable housing (i.e., living in a workplace, rented room, car or other vehicle, abandoned building, shelter or welfare residence, jail, medical care organization, or on the street). Participants in this study included IDUs receiving methadone treatment and those who sought methadone therapy for the first time. History of methadone treatment was therefore categorized as "never" or "currently on methadone treatment".

Substance use and injection practices included number of years of injecting, categories of drugs used during the previous 3 months, history of drug overdose (worded "By drug overdose, we mean taking enough drugs to threaten the life"), history of cutaneous abscesses, and any alcohol use during the previous 3 months. Sexual behaviors surveyed included number of sex partners and sexual acts during the previous 3 months. Because IDUs are a socially-marginal and low-income population,[22] this study evaluated participants' social support using the following two questions: "When you need advice on personal matters, is there anyone who will listen to you?" and "When you want to borrow 1000 NTD or something valuable, is there anyone who will lend or give it to you?" The responses to these two questions were "yes", "no" and "do not know".

### 2.3. HIV testing

After the above interview, participants had their blood drawn for HIV testing. HIV antibody testing was performed by the Kun-Ming Laboratory (Taipei, Taiwan), using an enzyme-linked immunosorbent assay (HIV 1/2 version 2; Genscreen, Victoria, Australia) followed by Western blot confirmation of reactive samples, according to standard protocols.[23]

### 2.4. Statistical analysis

Descriptive statistics were used to analyze participant background characteristics and outcome variables. Categorical variables were dummy coded for further analysis. The ordinal variables were evaluated for the linear correlation with each HRQOL domain. Linear regression was used to assess univariate and multivariate associations of selected factors with each HRQOL domain. All variables found to be significant ($p < 0.10$) in univariate analysis were considered for inclusion in multiple linear regression analysis. Backward stepwise regression was performed to yield the final model, which included factors with $p < 0.05$. Analyses were conducted using the SPSS version 21.0 (SPSS Inc., Chicago, IL, USA).

### 3. Results

A total of 802 eligible IDUs were enrolled in the study and completed both the interview and blood testing. The mean (SD) scores for physical, psychological, social, and environmental HRQOL were 13.2 (2.3), 11.8 (2.6), 12.5 (2.5), and 12.5 (2.3), respectively (Table 1). Overall, 85.4% of participants were male, and the mean (SD) age was 44.7 (8.7) years. Approximately 93.4% (749) individuals were currently receiving methadone treatment, 28.9% (232) had a history of drug overdose, and 18.1% (145) were HIV-positive. Approximately 86.7% (695) of participants had a history of incarceration, with the mean (SD) number of incarcerations being 2.7 (2.0). Approximately 80.2% (643) individuals were able to get advice from others, and 88.7% (711) were able to borrow 1000 NTD or something valuable from others if needed.

Table 1
Characteristics of IDUs at methadone clinics in Taipei, Taiwan, from March 2012 through April 2013.

| | Mean (SD) or $n$ (%) |
|---|---|
| WHOQOL-BREF domain | |
| Physical | 13.2 (2.3) |
| Psychological | 11.8 (2.6) |
| Social | 12.5 (2.5) |
| Environmental | 12.5 (2.3) |
| Sociodemographics | |
| Age (y) | 44.7 (8.7) |
| Sex | |
| Female | 117 (14.6) |
| Male | 685 (85.4) |
| Education level completed | |
| ≤ Elementary school | 112 (14.0) |
| High school or above | 690 (86.0) |
| Marital status | |
| Unmarried | 390 (48.6) |
| Married | 199 (24.8) |
| Divorced | 202 (25.2) |
| Widowed | 11 (1.4) |
| Body mass index (kg/m$^2$) | |
| Normal (18.5−24.9) | 519 (64.7) |
| Underweight (< 18.5) | 30 (3.7) |
| Overweight (≥ 25) | 46 (5.7) |
| Main source of income[b] | |
| Regular job | 447 (55.7) |
| Temporary jobs or other noncriminal sources | 320 (39.9) |
| Criminal sources | 35 (4.4) |
| Currently receiving methadone treatment | |
| No | 53 (6.6) |
| Yes | 749 (93.4) |
| Housing status[b] | |
| Stable | 506 (63.1) |
| Unstable | 296 (36.9) |
| Number of incarcerations | 2.7 (2.0) |
| Substance use and injection practices | |
| Duration of drug use | |
| < 10 y | 147 (18.3) |
| ≥ 10 y | 655 (81.7) |
| Injecting heroin[a] | |
| No | 230 (28.7) |
| Yes | 572 (71.3) |
| Smoking amphetamine[a] | |
| No | 678 (84.5) |
| Yes | 124 (15.5) |
| History of drug overdose | |
| No | 570 (71.1) |
| Yes | 232 (28.9) |
| History of cutaneous abscess | |
| No | 692 (86.3) |
| Yes | 110 (13.7) |
| Any alcohol use[b] | |
| No | 617 (76.9) |
| Yes | 185 (23.1) |
| Sexual behaviors and HIV testing | |
| Number of sex partners[a] | 0.6 (1.4) |
| Number of sex acts[a] | 5.0 (11.2) |
| HIV infection | |
| No | 657 (81.9) |
| Yes | 145 (18.1) |
| Social support | |

Table 1 (continued )

|  | Mean (SD) or n (%) |
|---|---|
| "When you need advice on personal matters, is there anyone who will listen to you?" | |
| No | 80 (10.0) |
| Yes | 643 (80.2) |
| Unknown | 79 (9.9) |
| "When you want to borrow 1000 NTD or something valuable, is there anyone who will lend or give it to you?" | |
| No | 45 (5.6) |
| Yes | 711 (88.7) |
| Unknown | 46 (5.7) |

IDU = injection drug user; QOL = quality of life; HIV = human immuno-deficiency virus; NTD = New Taiwan Dollars; SD = standard deviation.

[a] During the previous 3 months.
[b] During the previous 6 months.

The mean (SD) scores for physical, psychological, social, and environmental HRQOL in IDUs with injecting drug > 10 years were 13.2 (2.4), 11.7 (2.5), 12.5 (2.5), and 12.4 (2.3), respectively. Also, the mean (SD) scores for physical, psychological, social, and environmental HRQOL in IDUs with injecting drug < 10 years were 13.2 (2.3), 12.0 (2.6), 12.7 (2.4), and 12.8 (2.3), respectively.

Table 2 shows participant characteristics associated with each HRQOL domain in univariate analysis. Physical, psychological, social, and environmental HRQOL were negatively associated with obtaining the most income from temporary jobs or other noncriminal sources during the previous 6 months, a greater number of incarcerations, a history of drug overdose, a history of cutaneous abscess, and HIV positivity; and were positively associated with social support, as indicated by the ability to obtain advice and money or something valuable, when needed. Receiving methadone treatment was significantly associated with better physical and psychological HRQOL scores, while underweight was associated with poor physical and psychological HRQOL scores. In addition, being married and having greater numbers of sex partners and sex acts were positively associated with psychological, social, and environmental HRQOL.

Backward stepwise multiple linear regression analysis showed that, after controlling for other variables, all HRQOL domains (namely, physical, psychological, social, and environmental) were negatively associated with obtaining most income from temporary jobs or other noncriminal sources during the previous 6 months ($\beta = -1.00, -1.03, -1.15$, and $-1.22$, respectively) and positively associated with social support, i.e., ability to obtain advice ($\beta = 0.56, 0.87, 0.83$, and 0.64, respectively; Table 3). In addition, physical and psychological HRQOL were negatively associated with unstable housing ($\beta = -0.39$ and $-0.45$, respectively), history of drug overdose ($\beta = -0.40$ and $-0.53$, respectively), history of cutaneous abscess ($\beta = -0.45$ and $-0.53$, respectively), and HIV positivity ($\beta = -0.41$ and $-0.58$, respectively) but positively associated with receiving methadone treatment ($\beta = 1.47$ and 0.79, respectively). Furthermore, social and environmental HRQOL were negatively associated with male sex ($\beta = -0.64$ and $-0.70$, respectively) but positively

associated with social support (ability to obtain money or something valuable; $\beta = 1.25$ and 1.45, respectively). With each additional incarceration, the scores for psychological, social, and environmental HRQOL decreased by 0.11, 0.11, and 0.12, respectively.

## 4. Discussion

This study found that a complex array of factors influenced the physical, psychological, social, and environmental health of IDUs. In particular, social support was associated with good HRQOL, while participants who obtained most of their income from temporary jobs or other noncriminal sources were more likely to have poor HRQOL. Also, receiving methadone treatment was associated with good physical health and psychological functioning. By contrast, a history of drug overdose and cutaneous abscess and HIV positivity was associated with a decrease in physical and psychological HRQOL. Furthermore, male sex and a greater number of incarcerations were associated with poor social and environmental HRQOL.

This study further evaluated the factors associated with HRQOL after stratifying study participants by sex and duration of drug use. In male and individuals injecting drugs > 10 years, respectively, social support was significantly associated with better HRQOL in all domains, while obtaining most income from temporary jobs or other noncriminal sources was significantly associated with worse HRQOL in all domains.

This study showed that poor HRQOL were associated with a number of factors among IDUs at methadone clinics in Taipei, Taiwan. However, the adjusted $R^2$ for all domains of HRQoL ranges between 0.13 and 0.19, which indicates that many explanatory variables are not included in the final models. Therefore more studies are needed to explore the factors associated with HRQOL in this socially marginal population.

As noted in previous reports,[10,11] we found that IDUs in an MMTP had poor HRQOL. Those studies, however, examined only physical and psychological health. We administered the Taiwan version of the WHOQOL-BREF, which includes measures of physical and psychological health as well as social and environmental health. A previous study indicated that social and environmental health were associated with IDUs' adherence to treatment.[16] Although the instruments used to assess HRQOL have varied, past[10,11] and present evidence indicates that routine monitoring of the health status of IDUs is imperative in guiding preventive interventions and health maintenance strategies.

As compared with other populations in Taiwan, IDUs had lower HRQOL scores than obese patients,[14] health care workers,[24] and factory workers.[25] Also, IDUs who had injected drugs > or < 10 years had poor HRQOL compared with other populations in Taiwan.[14,24,25] Indeed, IDUs have contributed to the growth of the HIV/AIDS epidemic in Taiwan since 2004.[17] To slow the surge in HIV among IDUs, the Taiwan Centers for Disease Control began a harm reduction program in 2006, including methadone therapy for heroin addicts. Because good HRQOL reduces the relapse risk among

Table 2
Regression coefficients (standard error) from univariate linear regression analyses of HRQOL among IDUs at methadone clinics in Taipei, Taiwan, from March 2012 through April 2013.

| | HRQOL domain | | | |
|---|---|---|---|---|
| | Physical | Psychological | Social | Environmental |
| Sociodemographics | | | | |
| Age (y) | −0.01 (0.01) | −0.02 (0.01) | −0.03* (0.01) | −0.01 (0.01) |
| Male sex | −0.11 (0.24) | 0.06 (0.26) | −0.63* (0.25) | −0.58* (0.23) |
| Education level completed (ref. ≤ elementary school) | | | | |
| High school and above | 0.20 (0.12) | 0.19 (0.13) | 0.15 (0.13) | 0.23 (0.12) |
| Marital status (ref. unmarried) | | | | |
| Married | 0.22 (0.19) | 0.85*** (0.21) | 0.68*** (0.20) | 0.59** (0.19) |
| Divorced | −0.20 (0.19) | −0.36 (0.21) | −0.10 (0.20) | −0.22 (0.19) |
| Widowed | 0.38 (0.71) | 0.12 (0.78) | 0.76 (0.76) | 0.23 (0.71) |
| Body mass index (kg/m$^2$) (ref. normal) | | | | |
| Underweight (<18.5) | −0.93* (0.44) | −1.39** (0.47) | −1.07* (0.46) | −0.47 (0.44) |
| Overweight (≥25) | −0.06 (0.18) | 0.10 (0.19) | 0.17 (0.19) | 0.22 (0.18) |
| Main source of income[b] (ref. regular job) | | | | |
| Temporary jobs or other noncriminal sources | −1.19*** (0.16) | −1.37*** (0.18) | −1.47*** (0.17) | −1.38*** (0.16) |
| Criminal sources | −0.44 (0.41) | −0.71 (0.44) | 0.08 (0.43) | −0.01 (0.40) |
| Currently receiving methadone treatment | 1.44*** (0.33) | 0.78* (0.36) | 0.48 (0.35) | 0.51 (0.33) |
| Unstable housing[b] | −0.37* (0.17) | −0.33 (0.19) | −0.10 (0.18) | −0.42* (0.17) |
| Number of incarcerations | −0.14*** (0.04) | −0.21*** (0.04) | −0.22*** (0.04) | −0.19*** (0.04) |
| Substance use and injection practices | | | | |
| Duration of drug use ≥10 y | −0.01 (0.21) | −0.26 (0.23) | −0.16 (0.23) | −0.38 (0.21) |
| Injecting heroin[a] | −0.28 (0.18) | −0.19 (0.20) | −0.20 (0.19) | −0.24 (0.18) |
| Smoking amphetamine[a] | −0.32 (0.23) | −0.27 (0.25) | −0.29 (0.24) | −0.19 (0.23) |
| History of drug overdose | −0.66*** (0.18) | −0.94*** (0.20) | −0.79*** (0.19) | −0.57** (0.18) |
| History of cutaneous abscess | −0.68** (0.24) | −0.83** (0.26) | −0.53* (0.26) | −0.58* (0.24) |
| Any alcohol use[a] | 0.23 (0.23) | 0.34 (0.21) | 0.31 (0.21) | 0.01 (0.20) |
| Sexual behaviors and HIV testing | | | | |
| Number of sex partners[a] | 0.10 (0.06) | 0.16* (0.07) | 0.13* (0.06) | 0.13* (0.06) |
| Number of sex acts[a] | 0.01 (0.01) | 0.03*** (0.01) | 0.04*** (0.01) | 0.02* (0.01) |
| HIV positivity | −0.68** (0.21) | −1.02*** (0.23) | −0.76*** (0.23) | −0.71*** (0.21) |
| Social support | | | | |
| Someone to talk to if needed | 0.88*** (0.21) | 1.39*** (0.22) | 1.46*** (0.21) | 1.38*** (0.20) |
| Someone who will lend 1000 NTD or something valuable if needed | 1.15*** (0.26) | 1.81*** (0.28) | 2.12*** (0.27) | 1.74*** (0.25) |

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
HRQOL = health-related quality of life; HIV = human immunodeficiency virus; IDU = injection drug user; NTD = New Taiwan Dollars.
[a] During previous 3 months.
[b] During previous 6 months.

IDUs,[4] intervention programs to improve HRQOL are imperative for those in methadone treatment.

After controlling for potential confounders, a history of drug overdose was associated with poor physical, psychological, and social HRQOL, perhaps because IDUs had greater overdose-related morbidity[26] and thus poor subsequent HRQOL. Moreover, IDUs with a history of drug overdose are more likely to have a poor social network (e.g., involvement in sex work).[27] They are also more likely to suffer drug overdose in the future,[28] which might hamper the adherence to methadone treatment in this population. Therefore, IDUs with a history of drug overdose should be the target population to improve their HRQOL and compliance with methadone treatment.

This study found that a greater number of incarcerations was associated with poor psychological, social, and environmental HRQOL, perhaps because the stigma of incarceration added to feelings of worthlessness among IDUs and isolated them from society.[29] Moreover, incarceration of IDUs disrupts their family relationships and leads to homelessness or changes in housing status.[30,31] One study reported that the stigma of incarceration reinforced existing social inequalities,[32] which led to unfavorable attitudes, beliefs, and behaviors among IDUs. IDUs with a history of incarceration should thus be a target for programs that seek to improve HRQOL.

We found that receiving methadone treatment was associated with good physical and psychological HRQOL, which suggests that methadone treatment reduces heroin injection and leads to a more stable life among IDUs.[33] In addition, methadone treatment gives IDUs a general sense of well-being and euphoria, which lessens physical pain and anxiety.[34] To improve HRQOL in IDUs, methadone treatment should be proactively provided to this population.

This study showed that social support was associated with good physical, psychological, social, and environmental HRQOL. A previous study reported that perceived life support was negatively correlated with concurrent substance use among IDUs in a methadone program.[35] Such support may therefore improve HRQOL in this population. In addition,

Table 3
Regression coefficients (standard error) from multiple linear regression analyses of HRQOL among IDUs at methadone clinics in Taipei, Taiwan, from March 2012 through April 2013.

| | HRQOL domain | | | |
|---|---|---|---|---|
| | Physical | Psychological | Social | Environmental |
| Constant | 10.52*** (0.69) | 9.83*** (0.72) | 12.22*** (0.35) | 11.84*** (0.54) |
| Male sex | — | — | −0.64** (0.23) | −0.70** (0.22) |
| Married status (ref. unmarried) | — | 0.47* (0.19) | — | — |
| Underweight (ref. normal BMI) | — | −0.94* (0.43) | −0.88* (0.42) | — |
| Most income from temporary jobs or other noncriminal sources[b] (ref. regular job) | −1.0*** (0.17) | −1.03*** (0.18) | −1.15*** (0.17) | −1.22*** (0.16) |
| Currently receiving methadone treatment | 1.47*** (0.31) | 0.79* (0.33) | | |
| Unstable housing[b] | −0.39* (0.16) | −0.35* (0.17) | — | −0.47** (0.16) |
| Number of incarcerations (per incarceration) | — | −0.11* (0.04) | −0.11** (0.04) | −0.12** (0.04) |
| History of drug overdose | −0.40* (0.18) | −0.53** (0.19) | −0.37* (0.18) | — |
| History of cutaneous abscess | −0.45* (0.23) | −0.53* (0.24) | — | — |
| Number of sex acts[a] | — | 0.02* (0.01) | 0.02** (0.01) | — |
| HIV positivity | −0.41* (0.20) | −0.58** (0.22) | — | — |
| Someone to talk to if needed | 0.56** (0.22) | 0.87*** (0.23) | 0.83*** (0.22) | 0.64* (0.28) |
| Someone who will lend 1000 NTD or something valuable if needed | — | 0.83** (0.29) | 1.25*** (0.28) | 1.45*** (0.36) |
| Adjusted $R^2$ | 0.13 | 0.19 | 0.19 | 0.18 |

*p < 0.05; **p < 0.01; ***p < 0.001.
BMI = body mass index; HRQOL = health-related quality of life; HIV = human immunodeficiency virus; IDU = injection drug user; NTD = New Taiwan Dollars.
[a] During previous 3 months.
[b] During previous 6 months.

social support was found to improve adherence to methadone treatment among IDUs,[35] which could increase their sense of stability. The incorporation of substitution treatment into a social support program is highly recommended for improving life satisfaction and treatment outcome among IDUs.

This study found that obtaining most income from temporary jobs or other noncriminal sources during the previous 6 months was associated with poor physical, psychological, social, and environmental HRQOL. In Taiwan, because IDUs have to pay about 800 NTD for methadone treatment a month,[17] IDUs with unstable jobs may discontinue methadone treatment if they cannot afford the charge of methadone therapy. Poor adherence to methadone treatment could result in an unstable life[33] and cause poor HRQOL. To improve the HRQOL and adherence to treatment, more social support will be needed for IDUs obtaining most of their income from temporary jobs or other noncriminal sources.

Finally, HIV infection was associated with poor physical HRQOL, as was the case in previous studies.[11]

Certain limitations should be considered when interpreting our results. First, it is difficult to determine the cause–effect relationship between factors investigated in a cross-sectional study. Also, information about adherence to methadone treatment was not available in this cross-sectional study. Second, the data about heroin injection and sexual behaviors were all self-reported by IDUs and thus subject to recall bias and socially desirable responding.[36] To reduce the recall and socially desirable bias, drug and sexual behaviors were determined shortly (e.g., 3 months) prior to the interview.[37] Third, data on comorbidities such as hepatitis B or hepatitis C infection, alcoholism, hypertension, diabetes mellitus, and liver/renal diseases were not available for this study. Studies

about the association between medical comorbidities and HRQOL in IDUs are lacking[10,11]; future studies are needed. Fourth, the urine testing for illicit drugs other than opioids and amphetamines was not conducted among the participants. Therefore, it is unclear how concomitantly abused drugs might have affected the HRQOL of IDUs. Fifth, because drug overdose was self-reported, the prevalence of drug overdose might be underestimated. Sixth it is difficult to obtain a truly representative sample of a community-dwelling IDU population. It has been estimated that methadone clients account for 12.3% of reported heroin addicts in Taipei in 2010.[38] Thus, the generalizability of our findings might be limited to IDUs in methadone programs. Finally, information bias regarding IDU behaviors cannot be avoided when using a self-reported questionnaire. However, we attempted to reduce this bias by having interviews conducted by case managers, who provide the study participants with daily methadone treatment and psychological support.

In conclusion, our findings show that HRQOL scores were low among IDUs at methadone clinics in Taipei, Taiwan. The main goals of harm reduction programs are to enhance HRQOL and increase survival (i.e., not only to end drug use and needle sharing). To improve HRQOL among IDUs, future programs should focus on IDUs with history of drug overdose. In addition, to improve HRQOL among IDUs, it is imperative to combine social support mechanisms with methadone programs.

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