A Multilevel Analysis of the Demography of Drug Abuse in Hong Kong

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Chapter 1. The Demography of Drug Abuse in Hong Kong

Abstract

Drug abuse is a critical issue impairing social welfare including health, family relations and social security in many societies. This study explores the demographic characteristics of drug abuse among sub-populations in Hong Kong as a developed and ageing society with large socioeconomic disparities. Significant changes in both the number and rate of drug abuse by drug type, age, gender, ethnicity, district, education and economic activity from 1991 to 2016 are documented. Although narcotics analgesics are more common, stimulants and ketamine are growing popular in Hong Kong, especially among the youth. The number of elderly drug abusers is increasing due to the ageing population, whereas the rate of elderly drug abuse is actually stable or decreasing. In contrast, drug abuse rate is increasing for the middle-aged and for groups with lower education. The findings support social policy design to curb drug abuse, and call for closer attention to these at-risk groups that are overlooked in Hong Kong.

Keywords: drug abuse; substance use; demography; ageing; Hong Kong

1. Introduction

Drug abuse is a critical social issue in many societies worldwide. As a developed economy with large economic disparities and a rapidly ageing population, Hong Kong has been facing threats in illicit drug use over the past few decades (Cheung and Ch'ien, 1996). Numerous reports and news headlines show an intense pressure in tackling drug deals on the supply side, as well as a growing prevalence of drug use among young people on the demand side (Abdullah et al., 2002; Cheung and Cheung, 2006; Loxton et al., 2008). Addiction to drugs impairs health, work productivity, and family relations in the long run, inducing severe social anxieties and costs (McGrath and Chan, 2005; Shek et al., 2011).

Understanding the situation and trend in drug abuse is vital for social policies to tackle the issue and improve social welfare. This requires taking into account the latest demographic characteristics of different groups, such as young adults, females including pregnant ones, ethnic minorities and sexual minorities, which is key to understanding various social issues and changes (Dorling and Gietel-Basten, 2017). The demography of drug abuse measures the rate of change and emergence of at-risk groups relative to overall changes in the population. This entails exploring whether the number of drug abusers with characteristic x, such as ages above 60, growing more quickly or slowly than the population as a whole with characteristic x.

The rate of drug abuse is important for the following reasons. First, it can offer a consistent measure of the relative popularity of drug use among different groups over time and space both within Hong Kong and between Hong Kong and other parts of the world. The differentiation between the number and rate has been highlighted in epidemiological and demographic studies when calculating the number of deaths and the mortality rate, the latter of which is more suitable for comparisons between groups

(e.g., Hu and Goldman, 1990). The two metrics are important and complementary to each other. The absolute number reveals the overall severity of drug abuse, but it is only when we compare the absolute changes in numbers (the numerator) to overall trends in that population group (the denominator) as a whole can we isolate the population effect and determine the true extent of changes over time. In particular, Hong Kong has one of the most rapidly ageing populations in the world. As such, any increase in the number of older drug abusers would have to be cross-referenced with this population-level change in order to examine the true nature of the trend.[1] Second, efficient and effective allocation of limited resources requires prioritization based on rates of drug abuse that are comparable across sub-populations over time. This is crucial for developing social policies to cater for the varying needs of different sub-populations, the latter of which is highlighted as the one of the priority areas in Regular Funding Exercise of Beat Drugs Fund in 2017. Clearly, this priority is a clarion call for the improved targeting of interventions for groups who are at an increasing risk of drug abuse or who are increasingly falling victim to drug abuse. Third, there are various demographic and socioeconomic determinants of drug use in Hong Kong and elsewhere, such as peer influence, parental support and self-esteem (Chan 2014; Tse, et al., 2016; Wu et al., 2014). Therefore, it is important to gain a multi-dimensional understanding of the demography of drug abuse in order to design more effective and targeted interventions. Such an improved identification of trends over time will allow for a more accurate representation of trends in reported drug abuse through rates rather than relying on

[1] For example, the number of elderly drug abusers increased by 50 from 950 to 1,000, while the elderly population increased from 95,000 to 125,000. As a result, the rate of elderly drug abuse declined by 20 per 10,000 from 100 per 10,000 to 80 per 10,000. The absolute numbers call for more policy attention and resources allocated to the elderly people, but the increase is due to the ageing population over time. The rate of drug abuse suggests that the elderly drug abuse issue becomes less severe than before. Meanwhile, if the number of young drug abusers changed in a way opposite to the elderly (dropped from 1,000 to 950, while the young population dropped from 125,000 to 95,000), the severity of drug abuse among the young could be underestimated if only the total number of abusers is used. As such, it may not be the optimal policy to focus on the elderly people to tackle drug abuse.

absolute numbers. Lastly, the rate of drug abuse can be consistently applied in the evaluation of relevant social policies and programs, and can offer support for the design and implementation of policy instruments in the future.

However, the extent to which this 'reference to the demographic characteristics of the overall population' has been made in the scholarly literature and published reports has since been weak. There is currently no comprehensive published demographic study of trends in rates of drug abuse in Hong Kong, or in a comparative context. Indeed, owing to data availability, very few 'demographics of drug use' have been published in the literature (Kandel, 1991; Wright et al., 2014). Previous studies primarily rely on only absolute numbers of drug abuse cases to explore the trends in drug use over time in Hong Kong (e.g., Abdullah et al., 2002; Cheung and Ch'ien, 1996; Cheung and Cheung, 1996, 2018; Lee et al., 1998; Loxton et al., 2008; Smart and Murray, 1983). In addition to the literature, there were 72 official studies supported by the Hong Kong government during 1995-2014, among which 11 reports investigated the trends in the number of drug abusers; 30 examined the characteristics of abusers and the role of education; 14 studies evaluated rehabilitation programs; 9 surveyed on public opinion, and 8 studies explored the consequences of drug abuse. Overall, the literature and reports showed that illicit drugs, especially psychoactive drugs, are growing popular among the youth and minorities based on the absolute numbers of abusers and percentages of drug types within a group. However, none performs anything akin to a comprehensive analysis of trends and rates that takes into account the demographic changes. Since the population sizes vary by group over time, it is inappropriate to directly compare the numbers and percentages to measure the prevalence of drug abuse across groups over a long period. In addition, the previous studies offered outdated descriptions and conclusions based on limited data samples. More comprehensive and

updated analysis on the situation and trends of drug abuse is needed to support social work and policy design.

This paper fills the research gap by examining the changes in rates of drug abuse in Hong Kong based on the most comprehensive data on drug abuse and population over a long period from 1991 to 2016. We aim to construct a demography of drug abuse for Hong Kong, which will identify changes in rates of (different types of) drug abuse by various socioeconomic, demographic and geographic characteristics. This will lay the foundation of future identification of key determinants of drug abuse, and will further support the design and implementation of social policies in tackling drug abuse. The analysis can also be applied to many other societies with drug abuse issues among an ageing population.

2. Materials and Methods

2.1 Drug Abuse

Our evidence for understanding the emerging at-risk groups is generally derived from the Central Registry of Drug Abuse (CRDA) at Narcotics Division (ND) in Hong Kong. The goal of CRDA is to examine changes over time in patterns of drug use and to facilitate 'the planning of anti-drug strategies and drug abuse program in Hong Kong' (Legislative Council Secretariat, 2009). Since 1972, CRDA reports based on the registry have rightly been the primary source of drug abuse data for both stakeholders and the media (Wat, 1985; Census and Statistics Department, 2016). According to the Hong Kong Narcotics and Anti-money Laundering Report, 2007-2010, the CRDA data are reported by as many as 65 agencies, including Drug Addiction Treatment Centre of Correctional Services Department, Hong Kong Police Force, Methadone Treatment Program under Department of Health, Social Welfare Department, Substance Abuse

Clinics under Hospital Authority/Hospitals/Clinics, Non-government Organizations (NGOs, such as Drug Treatment and Rehabilitation Centres, Out-Reaching Teams/Integrated Services Centres, Counselling Centres for Psychotropic Substance Abusers, Centres for Drug Counselling) and schools.

CRDA provides the most representative data for drug abuse in Hong Kong with a low under-reporting ratio and is supported by recent scientific evidence on drug prevalence. For instance, in 2008 and 2009, the rates of non-reported abusers to reported abusers were 9.7% and 7.8%, respectively (Narcotics Division, 2011). Notably, the CRDA data conform to recent scientific studies using wastewater analysis to measure drug use in Hong Kong (Lai et al., 2013). The comprehensive data on drug abuse and population from 1991 to 2016 allow us to examine both the historical and latest changes in drug abuse in Hong Kong.

A major difference between CRDA reporting and ours is that CRDA mainly reports the absolute numbers and percentages without considering the changes in population size for a specific group. For example, in the CRDA Sixty-fifth Report, 'the total number of reported drug abusers has been decreasing steadily after a peak of 14,241 in 2008. In 2015, the total number of reported drug abusers was 8,598, 5% lower than 2014 (at 9,059) and 40% lower than 2008' (Narcotics Division, 2016). The only reference to the overall population is a simple single-year 'ratio of reported drug abusers to population'. In general, CRDA reports the trends, summary characteristics of abusers by major drug categories, as well as newly and previously reported drug abusers based on the absolute numbers in each year only. As aforementioned, we supplement the CRDA reporting and the literature by introducing the rate of drug abuse and suggest including it in the reports to take into account the population changes to offer consistent measurement of drug abuse rate across various groups.

The CRDA data contain detailed information on age, gender, ethnicity, education, economic activity, district of residence of each individual drug abuser. The illicit drugs can be categorized as narcotics analgesics, stimulants, depressants, tranquillizers, sedatives/hypnotics, hallucinogens, or other drugs. Narcotics analgesics include Opium, heroin, Fentanyl, Pentazocine, Tilidate or Tilidine. Stimulants include Amphetamines, Cocaine, Methamphetamine and anti-depressants. Depressants include Quinalbarbitone, Methaqualone, Meprobamate. Tranquillizers include Bromazepam, Chlordiazepoxide, etc. Hallucinogens mainly include Cannabis and lysergic acid diethylamide (LSD). Sedatives/hypnotics include sleeping pills, Zopiclone, etc. Other drugs mainly include ketamine.

Each drug abuser has a unique case number to trace the identity in CRDA data. Some abusers were repeatedly reported by multiple organizations within a year or consecutively over the years, resulting in 666,665 observations of abuse cases in total. We drop the repetitions in reporting within a year. Overall, there were 98,016 drug abusers reported during 1991 to 2016 in Hong Kong.

2.2 Census

The information on the Hong Kong population is retrieved from the Census. The Hong Kong Census data covers the 5% population in 1991, 1996, 2001, 2006, 2011 and 2016. Key information includes age, gender, education, economic activity, district of residence and ethnicity, allowing us to recode the information and match it with the CRDA data. These factors are widely adopted to measure demographic patterns sufficiently (Kandel, 1991). Since there are no census data in other years, an interpolation is needed to estimate the population between the census years as described below.

2.3 Methods

The construction of a 'demography of drug abuse' requires the systematic cross-examination of evidence relating to drug abuse (as the numerator) to Census data (as the denominator). This involves the examination of rates of drug abuse (including different types and categories of drug) according to age, gender, ethnicity, district, education, economic activity and so on.

Specifically, we first explore trends of drug abuse in the CRDA data. We compare the numbers of drug abusers to Census data and construct rate of drug abuse as follows:

$$Drug\ Rate_{iy} = Drug\ Number_{iy}/P_{iy} \quad (1)$$

where $Drug\ Rate_{iy}$ is the rate of drug abuse in group i in year y. $Drug\ Number_{iy}$ is the total absolute number of drug abusers in group i in year y, and P_{iy} is the total corresponding population with an unit of 10,000 people. Hence, we define the drug abuse rate as the number of abusers per 10,000 in a group. A group can be categorized by age, gender, ethnicity, education, economic activity, etc. Equation (1) can be further applied in estimating the abuse rate of different drug types.

As the Census data is only gathered (in effect) every five years, we interpolate the Census data linearly to obtain annual estimates of population in-between each census point during 1991 to 2016:

$$P_{iy} = P_{i0} + (y - y_0) * (P_{i5} - P_{i0})/(y_5 - y_0) \quad (2)$$

where year y is between two census years y_0 and y_5. P_{iy}, P_{i0}, and P_{iy} are the corresponding population of group *i*, respectively. The interpolated population data are then matched with CRDA drug data by year and demographic characteristics using Equation (1), allowing for calculating the rate of drug abuse by these groups. We then examine the changes in rates of drug abusers in Hong Kong.

3. Results

3.1 Number of Drug Abusers

Table 1 summarizes the characteristics of drug abusers in Hong Kong in 1991, 1996, 2001, 2006, 2011 and 2016. In general, most of drug abusers in Hong Kong are Chinese males between 20 and 50 years old, especially the young people. They are not well educated and are likely to be unemployed, with educational attainment below secondary schooling. This depicts the low-income group in Hong Kong. Many of them live in districts with higher population density and crime such as Sham Shui Po, Kwun Tong and Yau Tsim Mong, or remote areas such as Yuen Long.

The most popular drugs are narcotics analgesics, stimulants and ketamine. Tranquillizers and hallucinogens are less popular in Hong Kong, contributing only 5.3% of the total abusers in 2016, as shown in Table 1. Hallucinogens are common but ketamine are not in the western countries (Degenhardt and Dunn, 2008; Sassano‐Higgins et al., 2016). Depressants, sedatives or hypnotics are totally unpopular in Hong Kong.

[Table 1]

Figure 1 plots the number of drug abusers in Hong Kong during 1991 to 2016. There is a declining trend of drug abuse in Hong Kong over the years. However, there are three major waves with peaks in 1994, 2001 and 2008. The saddle points are in 1992, 1999 and 2006. In these three waves, the number of drug abuse cases would keep increasing for the first two years and then would decline continuously for five years. We also observe a gender difference in that most (80%) drug abusers are male, and it is the males driving the patterns in drug abuse, while female addiction cases are substantially smaller with a general inverted-U shape. If we further differentiate newly reported cases from previous ones, the fluctuations in total tolls are seemingly driven

by new cases each year (as shown by the green dashed line), while there is a continuous decline for the previously reported cases.

[Figure 1]

The patterns in Figure 1 are likely related with changes in drug demand in Hong Kong, given the consistent efforts by the police department in tackling drug supply. First, the sharp increase in drug abuse in 1990s can be explained by fewer job opportunities and lower upward mobility of young people, and the weakened protection from the family and school (Cheung and Cheung, 2018). Second, ecstasy abuse increased with the prevalence of rave parties in 2000 (Narcotics Division, 2011). Third, the peak in 2008 is related with a sudden popularity of ketamine among the young people, which is a party drug widely believed to have low purchasing and addiction costs (Smith et al., 2002). The continuous decline in the number of reported drug abusers after 2008 was likely related with the drop in drug demand due to more efforts from the government and NGOs. For instance, a high-level inter-departmental task force was set up in late 2007 to tackle drug abuse among the youth, and NGOs were commissioned by the ND to provide drug education programs to students.[2]

3.2 Distribution by District

Figure 2 shows the spatial distribution of drug abusers in Hong Kong. A substantial number of drug abusers live in relatively poor regions with higher population density including Sham Shui Po and Yau Tsim Mong. These regions have many tourists and sex workers. Drug abusers are also more likely to reside in remote areas with high criminal records, such as Yuen Lung and Tuen Mun. In addition, the number of drug abuse is low in more developed commercial regions on Hong Kong Island, such as Central and Wan Chai. More bars are located in this areas, offering alcohol as a

[2] https://www.info.gov.hk/gia/general/200710/17/P200710170277.htm.

substitute for drugs. These observations are consistent with previous findings on the relationship between drug abuse and economic activity (Bachman et al., 2007).

In general, the number of drug abusers was declining in these hotspots and other districts in Hong Kong universally after 2001, as shown by Table 2.

[Figure 2]

[Table 2]

3.3 Rate of Drug Abuse

The number of drug abusers offer an overall picture on the drug abuse situation in Hong Kong. This section further explores the demographic patterns of drug abuse in detail with a focus on rate of drug abuse, which is defined as the number of drug abusers per 10,000 people for each demographic category.

3.3.1 Drug type

We start with the most common illicit drug, narcotics analgesics, to compare the number and rates of drug abuse for different age-groups. The number of narcotics analgesics abusers has been decreasing for ages below 50 since 1996, as shown by the blue (age 20-30), green (age 30-40) and yellow (age 40-50) lines on the left panel of Figure 3a. Similarly, the rate of these drug abusers continuously dropped, as shown by the right panel of Figure 3a. However, the percentage changes in rates are larger than the percentage changes in absolute numbers. This reveals the changes in population structure by age, as the cohort of young people is shrinking due to the ageing population. Before 2006, although the absolute number of drug abusers at 50-60 was growing, the rate of drug abuse remained steady, reflecting that the changes in absolute numbers were mainly due to an increasing population at 50-60. Similarly, more elderly people between 60 and 70 were reported to take narcotics analgesics in the recent decade (shown by the left panel of Figure 3a). If we consider the ageing of population, however,

the ratio of these abusers over the total number of abusers at 60-70 remained flat, as shown by the orange line on the right panel of Figure 3a. Similarly, the number remained stable for people above 70, but the rate was decreasing due to the growth in population in this group. This shows that the increase in number of elderly people taking narcotics analgesics is simply caused by the population structure change rather than that more people in the same cohort above 60 begin to take drugs. In other words, elderly people are unlikely to be newly addicted to drugs.

Stimulants are the second most popular drugs following narcotics analgesics. In Figure 3b, we observe an increasing and similar trend in both the absolute number and rate of people taking stimulants above 20 years old. People above 60 years old have both lower numbers and rates of stimulant abuse, suggesting that the elderly do not prefer stimulants. The number and rate of abusers below 20 years old peaked in 2000 and 2005, and were continuously dropping afterwards, revealing significant regulatory efforts by the government and other organizations targeted at the youth and students in recent years.

Besides narcotics analgesics and stimulants, most of other drugs is ketamine, which is prevalent among the youth and middle-aged group. As aforementioned, ketamine is a club drug which costs less than traditional illicit drugs such as narcotics analgesics, and there is a common misconception that ketamine has a lower addiction likelihood and cost (Smith et al., 2002). Particularly, the youth has a large share of ketamine abuse (there were over 3,800 ketamine abusers between 10 and 30 years old in 2009). The changes in numbers and trends are different between the youth and middle-aged groups in Figure 3c. An increasing number and proportion of people between 30 and 50 (the green and brown lines) are taking ketamine during the past 25 years, but the popularity among people between 10 and 30 (the black and blue lines)

was declining since 2009. Again, this may be due to more regulatory and educational efforts in response to the raising alarm of youth taking ketamine before 2009. In addition, although there were more ketamine abusers at age 20-30 than those at age 10-20 in 2008 and 2009, the rates of ketamine abusers at age 20-30 were lower correspondingly (as shown by the peaks in Figure 3c). This reflects a larger population at age 20-30, and highlights a higher severity of ketamine abuse at age 10-20 than that at age 20-30.

Tranquillizers, depressants, hallucinogens, sedatives/hypnotics are unpopular in Hong Kong. Still, we observe heterogeneous patterns in these drugs across different age-groups in Figure S1 in the supplemental material. For instance, tranquillizer abusers show an inverted-U shape in Figure S1a, with an increasing trend before 2006 and a decreasing trend after 2006. Particularly for the age group between 40 and 50 years old, although the absolute number of abusers is relatively stable during 2008 to 2016, the rate of tranquillizer abusers actually increased slightly. This suggests that the middle-aged people are likely to be newly addicted to tranquillizers. Furthermore, the number and rate of hallucinogen abusers declined among young people below 30 years old, but are increasing for the middle-aged group between 30 and 50 (Figure S1b). This may be related with large pressure from work and life for the middle-aged people, who also have higher income compared with the young and the elderly. Cannabis and LSD are less additive and may cause less harm to people compared with narcotics analgesics and stimulants, therefore the associated costs may be lower. Lastly, sedatives/hypnotics are popular among ages between 20 and 60 (Figure S1c). The changes in the numbers and rates are similar with tranquillizers, as they have similar functions.

[Figure 3]

3.3.2 Age and Gender

Table 1 shows that over 80% of drug abusers are males, and around 50% of abusers are between 20 and 40 years old. Although female drug abusers are small in number, the percentage share followed an inverted-U curve, rising from 8.4% in 1991 to 19.2% in 2006, and then dropped slightly to 18.1% in 2016.

Figure 4 further picks the age groups of 10-20, 40-50 and 60-70 in the three rows, and compares males on the left panel with females on the right panel. We choose the newly reported cases only to follow the drug abuse changes. The dark solid lines represent total number of drug abusers, and the blue solid lines denote the number of drug abusers per 10,000 people. First, as shown by the first row of Figure 4, both male and female young people are very responsive in drug abuse, who were driving the peaks in 1994, 2001 and 2008. They contribute to most of the newly reported cases, showing that the young people are more vulnerable in terms of taking drugs. As shown by previous studies, peer influence, relief of boredom/depression/anxiety, and curiosity are the top three reasons for illicit drug use (Lam et al., 2011). In addition, the total number and rate of young drug abusers are rather parallel for both males and females, suggesting that the number of young drug abusers and the young population were co-varying similarly.

Second, a further investigation by age group reveals a continuous increase in newly reported middle-aged females between 40 and 50 years old, as shown by the second row of Figure 4. The changes in rates are more significant than the total numbers during 2011 to 2016, revealing less growth in the middle-aged female population in comparison with the population of middle-aged female abusers. In comparison, newly reported male abusers between 40 and 50 years old show milder increase with more fluctuations than females in recent 10 years. This reduces the gaps in numbers of drug

abusers between males and females in the middle-aged group, from the gender ratio of 5:1 in 1991 to nearly 2:1 in 2016. The findings reveal a growing concern over drug addiction among the middle-aged group in Hong Kong nowadays. It may be related with more economic or social pressure from a wide range of factors, such as supporting the elderly and children, rising housing prices, increasing competition from immigrants, worse economic conditions, and so on. Further research is needed to investigate this issue, which is beyond the scope of this paper.

Lastly, the third row of Figure 4 chooses people aged between 60 and 70 as representative of the elderly. The number of newly reported elderly male abusers was declining during 1991 to 2006 but was quite stable with a slight increase ever after. In contrast, elderly female drug abusers are small in number and remain relatively stable over the years. We are not sure about the exact reasons behind the trends and gender differences in drug abuse for the elderly. Importantly, the rates of drug abuse decrease as age increases, as observed by comparing the subfigures in Figure 4 vertically.

[Figure 4]

The age and gender differences in drug abuse rates can be more clearly seen in Figure 5, which plots the age and gender distribution of overall drug-abuse population per 10,000 people in Hong Kong in each Census year. First, the male drug abuse rate is much higher than that of females almost at all ages. In particular, most of the elderly above 50 are males. The rates of male abusers at age 20-24 were over 160 per 10,000 people between 1996 and 2001. As for 2001-2011, the rate or ratio of female abusers at age 10-14 was higher than that of males. This reveals a rising popularity of drugs, mostly ketamine, among the young females during this period. Second, the changes in drug population structure between sexes are similar over the years. For instance, the rate of drug abusers below 15 years old experienced an increase from 1991 to 2001,

and then kept declining after 2001 for both males and females. The drug abuse rate of the elderly above 60 consecutively decreased. The changes in rate of middle aged drug abusers at 30-50 were small after 2001. Overall, the shapes of drug population distribution are similar in 1991 and 2016, with more drops in males at all ages than in females. Many new male abusers at age 20-24 were reported in 1996 and 2001. Female distribution follows the shape of pyramids during 1996-2006, with most females at age 15-19 across different age cohorts, exceeding 30 abusers per 10,000 people.

[Figure 5]

3.3.3 Ethnicity

Most of the reported drug abusers in Hong Kong are Chinese, including Hong Kong local residents and residents in Mainland China. However, their share was continuously decreasing from 95.5% in 1996 to 88.9% in 2016, as shown in Table 1. This reflects an increase in migration of people with other ethnicities. In particular, the number of drug abusers is growing for immigrants from South Asia, including Nepal, India, Pakistan, Bangladesh and Sri Lankan. Despite the small numbers, they are increasing rapidly and impose a potential threat on the Hong Kong society. These minorities are more likely to be unemployed and may be involved in illicit drug dealing. They also face high social pressure, which could increase the likelihood of taking drugs. Given the ageing population and changes in ethnic diversity in Hong Kong, social work policies shall pay more attention to the ethnic minorities in the future (Arat et al., 2016).

3.3.4 Education and Economic Activity

Most of drug abusers have lower or upper secondary education, taking up around 70% of the total drug abusers (as shown by Table 1). Nearly 20% of drug abusers receive primary education only. We select the age-group at 40-50 to construct the rate of drug abusers by education in this group, as their educational attainment is likely stable.

Figure 6 plots the number and rate of newly reported drug abusers with primary, lower-secondary, upper-secondary and tertiary education in each row, respectively. Males and females are plotted separately on the left and right column, respectively. We observe a decreasing trend in the number of newly reported drug abusers among groups with low-education attainment at primary levels during the past decade. However, the rate of drug abuse for males with primary education is inclining, while female drug abuse rate was declining but increased in 2014. In contrast, the number and rate of middle-education (lower secondary and upper secondary education) abusers were both increasing. The high-education group with tertiary education remains quantitatively stable over the years. Since higher education is positively correlated with higher income and social status, the drug abuse rate among well-educated people shall be typically lower than that in less educated groups. The increase in middle-education abusers suggests that the social pressure is spreading upward the social hierarchy. These pressures may be related with rising house prices and competition in the labor market, leaving the middle-education group more depressed. The results are consistent with previous empirical and theoretical analyses (Becker and Murphy, 1988).

[Figure 6]

Economic activity and education are two sides of the same coin. Over half of drug abusers are unemployed or part-time workers. Still, around one third of them are full-time workers, but the rate has been decreasing over the years. The rate of unemployed drug abusers was increasing during 1991 to 2006, and were declining ever after. Part-time workers are becoming more likely to take drugs in Hong Kong.

4. Discussion

Our analyses rest on two fundamental assumptions regarding the completeness of data in both the CRDA and the Census. First, the quality of CRDA data is generally good. Although there have been criticisms of the CRDA data (Siu, 2015), the under-reporting ratio is expected to be low as aforementioned. Nevertheless, there is a threat to construct validity (Cook et al., 2002) inasmuch as what is termed 'drug abuser' in this context is in fact the narrower definition of someone who has been reported by reporting agencies to CRDA; hence CRDA statistics do not cover those not reported to CRDA. As such, we shall be careful in our interpretations to avoid sweeping statements based on what will inevitably be only a partial representation of drug abusers in Hong Kong. Second, there should be no systematic bias in under-reporting in the CRDA.

As with all analyses of rates and determinants, there is a potential threat to statistical conclusion validity. First, the interpolation between census points may potentially skew the 'population' under analysis. However, our estimates are close to the official statistics on the overall population.[3] Given that the population structure may remain relatively stable in each 5-year period, the interpolation errors, if any, are likely too small to change the trends in drug abuse rate significantly. Second, while the CRDA covers a large sample, any exploration of intermediate level rates and subsequent analyses are likely to quickly become beset by the small number problem and hence lose statistical significance. Hence, we avoid large number of small categories in demography and only focus on bigger divisions and their combinations.

The demography of drug abuse provides fundamental support for future analysis and policy making. First, we suggest official reports to take into account the population changes and publish the drug abuse rate by sub-population in addition to the absolute

[3] https://www.censtatd.gov.hk/hkstat/sub/so20.jsp.

numbers and percentages. This will provide a more thorough understanding of the relative changes in drug abuse that isolate the effects of population variations, and can facilitate consistent comparisons of drug abuse both across cross-sectional groups and over time. Second, drug abuse rates can help find out the most at-risk groups and support drug policies to allocate resources more effectively and efficiently. For instance, the drug abuse rate of the middle-aged people was inclining, but received limited attention since only absolute numbers were considered previously, while the governmental programs on drug abuse funded by the Beat Drugs Fund primarily focus on the youth.[4] We highlight the changes in drug abuse rates and call for more policy attention to this new but overlooked issue. Third, future studies on drug abuse could investigate the effects of drug policies and programs on the rate of drug abuse based on our data and estimates, which can further support the evaluation and design of policies on tackling drug abuse.

5. Conclusion

There is an urgent need to understand the demography of drug abusers by estimating the true drug use rates among sub-populations in Hong Kong. Previous studies and reports primarily rely on absolute numbers of drug abusers. However, it is unclear to what extent the changes in numbers are driven by population changes. The introduction of demography of drug use isolates the effects of population differences and changes over time and offers a consistent and comparable measure of drug abuse. Hong Kong provides a good example with threats from both drug abuse and an ageing population, making it particularly important to consider the demographic changes in understanding

[4] See https://www.nd.gov.hk/en/beat.htm for a full list of programs on drug abuse.

drug abuse situation and trends. Essentially, identifying the trends and determinants of drug use will enable social policies to allocate resources to tackle drug use more effectively, particularly to prevent drug use at an early stage.

This study combines the most comprehensive data on drug abuse and population to construct the rate of drug abuse and explore the demography of drug abuse in Hong Kong. We find that stimulants and ketamine are growing popular among the young and middle-aged group in Hong Kong during 1991 to 2016. Given the ageing population, although the number of drug abusers is increasing among the elderly, the rate of drug abuse is stable or decreasing for the elderly group. By contrast, the number and rate of drug abuse is increasing for the middle-aged and for people with medium-level of education (secondary schooling). On average, higher rate of drug abuse is likely associated with lower education and lower income.

Our findings detail a careful profile of the drug-abusing population of Hong Kong. This allows relevant stakeholders to gain a more accurate picture of the demography of drug abuse in Hong Kong. In particular, the drug use among the youth has been a focus in the past, whereas the middle-aged and less-educated people received limited policy attention. Our findings call for more policy attention and resources to these emerging groups. We suggest CRDA to include the rate of drug abuse by population in the official reports, and policy-makers and social workers are encouraged to take this information into consideration in designing and implementing policies on drug abuse. The findings will further contribute to more effective interventions in terms of prevention and catering for their varying needs. Future studies can explore the determinants of drug abuse and evaluate the policies and programs in Hong Kong based on our data and findings.

Table 1. Number of Drug Abusers in Hong Kong

	1991	1996	2001	2006	2011	2016
Population (1,000)	5,752	6,436	6,714	6,857	7,072	7,337
Number of drug abusers	15,263	19,673	18,513	13,252	11,572	8,239
Rate (per 10,000)	27	31	28	19	16	11
Newly reported (%)	17.7	21.9	30.5	26.5	28.2	24.6
Previously reported (%)	82.3	78.1	69.5	73.5	71.8	75.4
Drug Type(%)						
Narcotics Analgesics	82.0	81.1	61.6	59.7	50.7	47.7
Stimulants	0.1	2.2	13.7	14.8	16.6	31.1
Others (ketamine)	1.5	2.7	7.0	15.3	27.4	13.0
Hallucinogens	2.2	6.3	3.4	3.9	1.8	3.2
Tranquillizers	0.8	1.5	1.0	5.2	2.5	2.1
Sedatives/Hypnotics	0.0	0.0	0.2	0.4	0.5	0.5
Depressants	0.2	0.1	0.0	0.2	0.0	0.0
Age(%)						
10-<20	7.4	15.2	17.6	16.7	14.5	4.8
20-<30	26.9	29.7	32.7	26.1	25.5	23.3
30-<40	31.4	23.5	19.8	23.3	25.3	26.4
40-<50	18.1	20.6	17.8	17.2	16.0	23.5
50-<60	8.5	6.2	8.7	13.0	13.4	13.4
60-<70	5.7	3.6	2.4	2.7	4.6	7.3
70+	1.9	1.2	0.9	0.9	0.7	1.3
Gender(%)						
Male	91.6	87.6	84.5	80.8	81.5	81.9
Female	8.4	12.4	15.5	19.2	18.5	18.1
Ethnicity(%)						
Chinese		95.5	95.3	91.4	91.7	88.9
Nepalese		0.6	1.1	1.3	2.6	3.4
Indian/Pakistani/Bangladeshi/Sri Lankan		0.2	0.2	0.5	1.0	3.2
Vietnamese		1.9	1.5	1.9	1.8	2.5
Other		1.8	1.9	4.9	2.9	2.0
Education(%)						
No schooling/kindergarten	5.7	4.3	1.9	1.7	1.1	1.4
Primary	45.2	34.6	26.0	26.3	20.9	17.0
Lower secondary (S1-S3)	32.6	47.6	50.3	50.1	51.8	44.4
Upper secondary (S4-S7)	9.6	11.3	18.0	18.1	20.8	21.6
Tertiary	0.5	0.7	0.8	1.0	1.7	2.8
Economic Activity(%)						
Unemployed	31.7	43.2	45.6	50.1	44.6	41.0
Full-time workers	62.5	42.8	34.7	29.8	31.8	27.7
Casual/part-time worker		7.9	6.8	7.3	11.3	10.6
Home-makers		0.7	1.3	1.4	1.7	2.2
Students		1.9	4.9	4.6	3.9	1.1
Others (retired/unknown)	5.8	3.5	6.7	6.8	6.7	17.4

Note: Number and percentage of drug abusers by different categories are listed.

Table 2. Number of Drug Abusers in Hong Kong Districts

District	1991	1996	2001	2006	2011	2016	2016 (%)
Sham Shui Po	1,583	1,787	1,656	1,322	1,194	874	10.61
Kwun Tong	1,866	2,294	1,799	1,248	993	768	9.32
Yau Tsim Mong	1,489	1,766	1,584	1,184	877	725	8.80
Yuen Long	652	1,156	1,268	928	1,120	713	8.65
Kwai Tsing	972	984	1,110	793	838	584	7.09
Tuen Mun	954	1,686	1,407	1,054	827	566	6.87
Wong Tai Sin	1,513	1,777	1,426	899	634	456	5.53
Sha Tin	624	1,001	1,046	789	618	404	4.90
North	424	705	776	643	661	384	4.66
Eastern	842	1,186	1,064	665	588	380	4.61
Kowloon City	775	871	872	463	366	310	3.76
Tsuen Wan	508	1,009	845	509	381	275	3.34
Tai Po	358	739	753	579	531	288	3.50
Sai Kung	129	340	492	349	329	259	3.14
Islands	82	182	158	245	330	209	2.54
Southern	566	825	773	555	374	187	2.27
Wan Chai	429	453	405	247	156	117	1.42
Central & Western	336	409	440	219	179	71	0.86
Unknown	1,161	503	639	561	576	669	8.12

Note: The annual total number of drug abusers in 18 districts of Hong Kong are shown for each census year from 1991 to 2016. The percentage share of drug abusers in 2016 is listed in the last column.

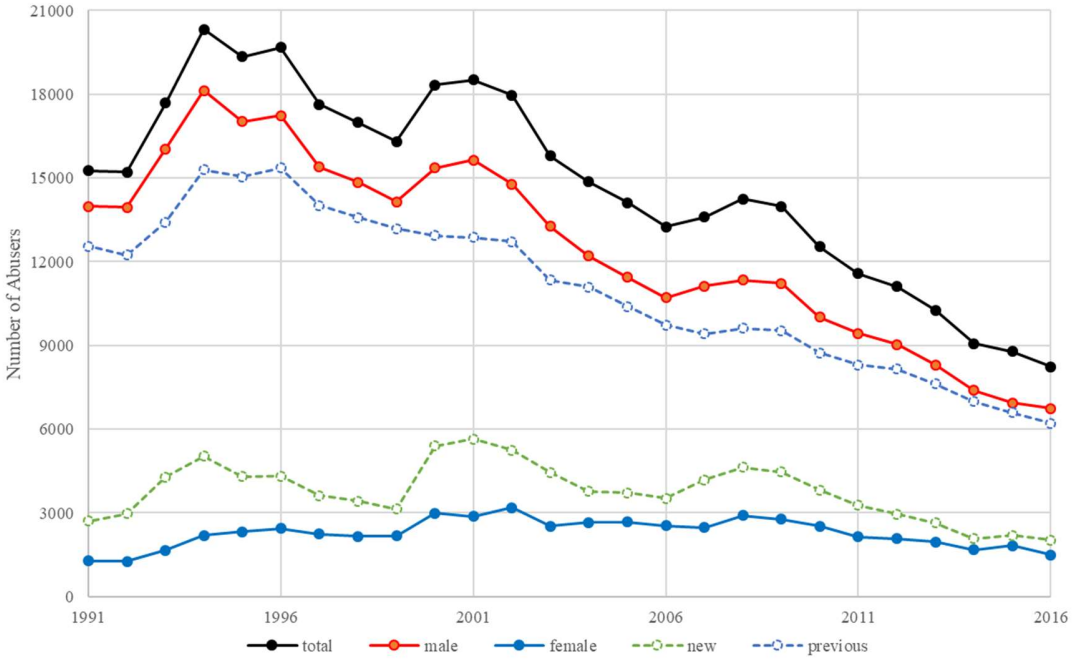


Figure 1. Number of Drug Abusers in Hong Kong in 1991-2016

Note: The black solid line presents the total number of drug abusers. The red and blue solid line show male and female drug users, respectively. The green and blue dashed line show the drug abusers that are previously or newly reported, respectively.

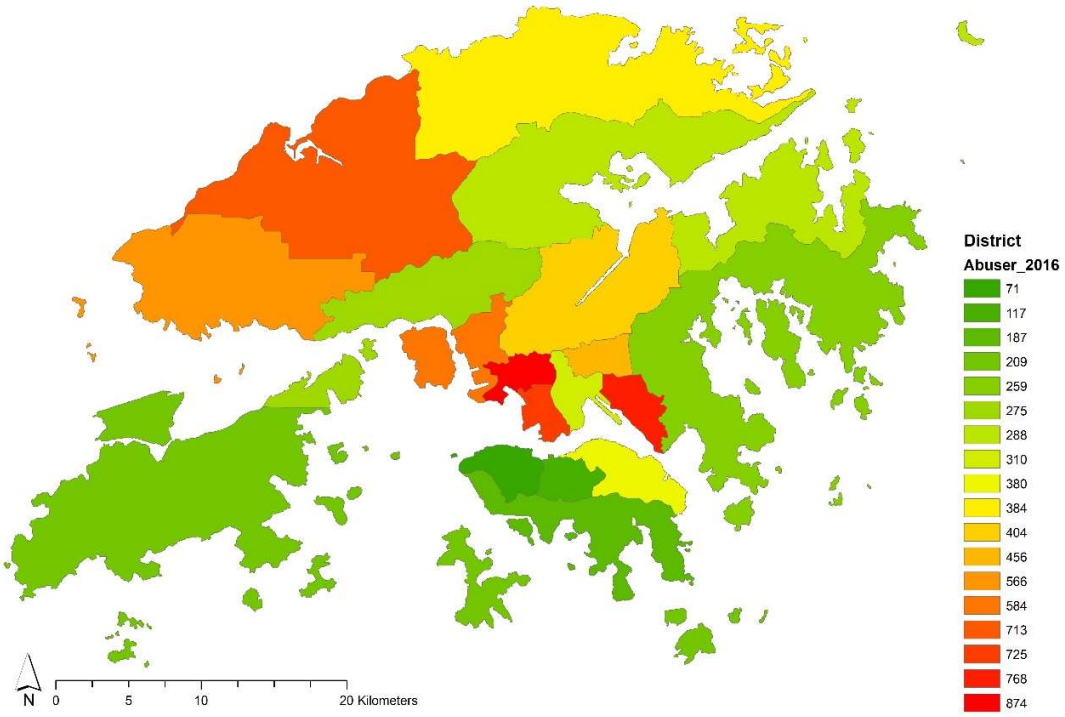
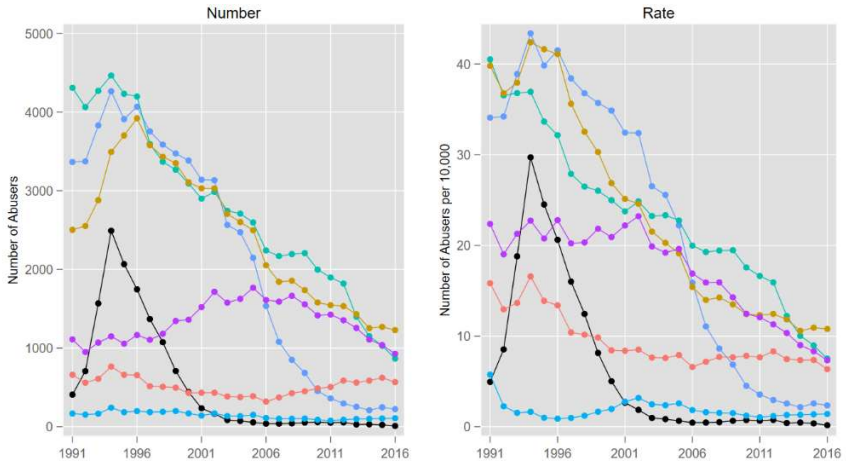
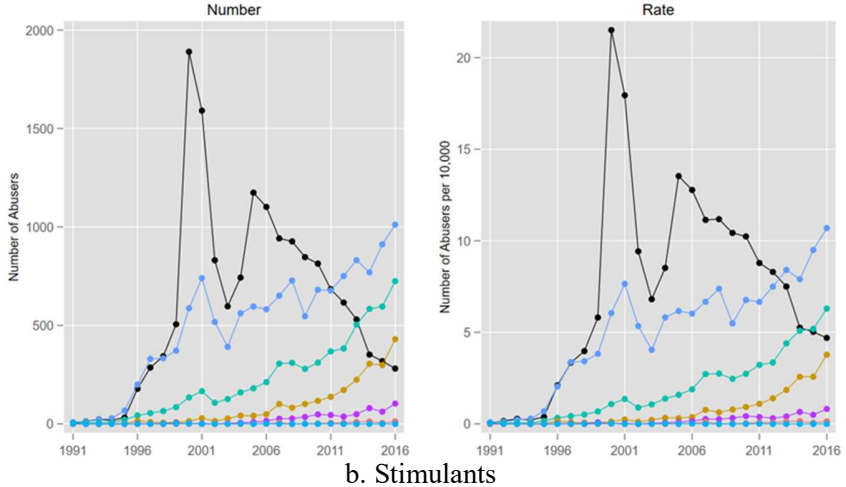


Figure 2. Distribution of Drug Abusers by Hong Kong District in 2016

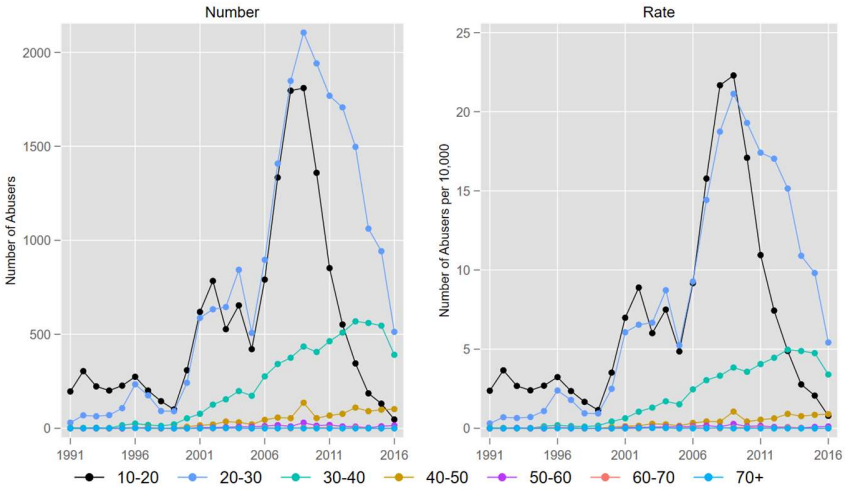
Note: The number of drug abusers in each of 18 Hong Kong districts in 2016 is shown with darker green colors indicating smaller numbers and darker red colors indicating larger numbers.



a. Narcotics Analgesics



b. Stimulants



c. Others (ketamine)

Figure 3. Number and Rate of Abusers by Drug Type

Note: Number and rate of drug abusers by age-group are plotted for narcotics analgesics, stimulants and others (ketamine), respectively.

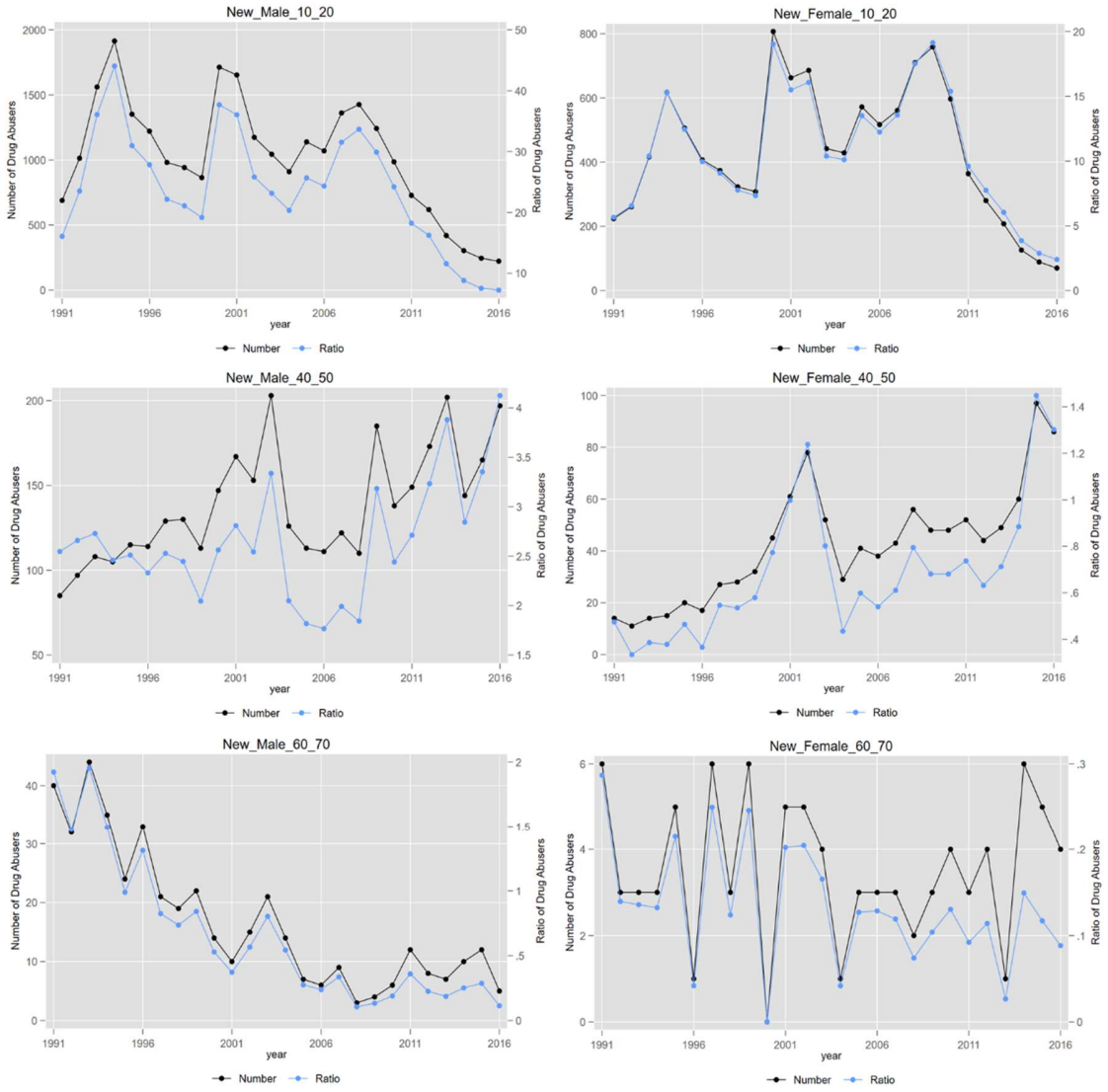


Figure 4. Number of New Drug Abusers by Age and Gender

Note: Newly reported drug abusers by gender and age were shown. Males are on the left panel, while females are on the right panel. The 10-20, 40-50 and 60-70 age groups are plotted in each row. The dark solid lines represent total number of drug abusers, and the blue solid lines denote the rate of drug abusers per 10,000.

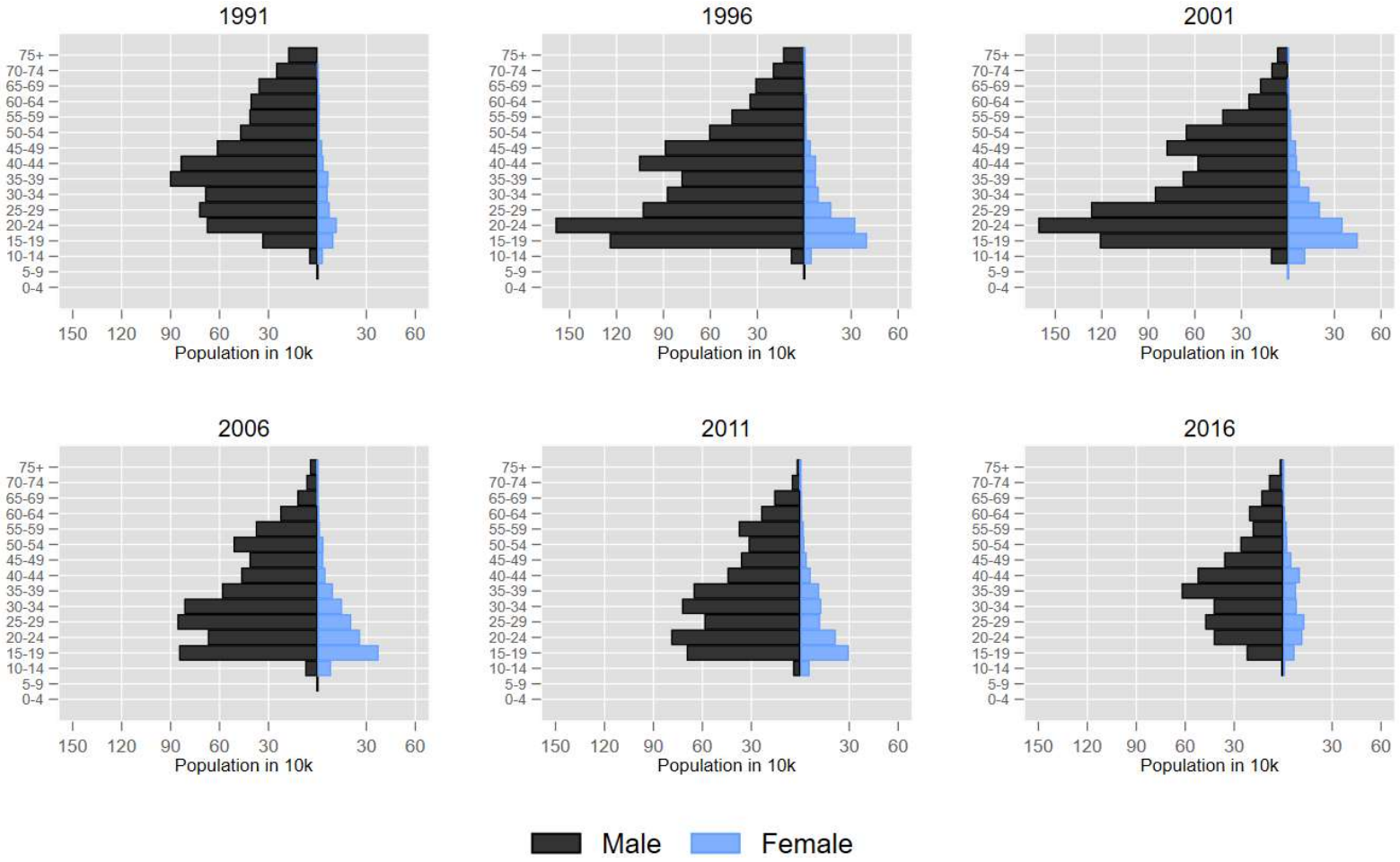


Figure 5. Rate of Drug Population by Age and Gender

Note: Number of drug abusers per 10,000 by age and gender is plotted for each year in 1991, 1996, 2001, 2006, 2011 and 2016 in Hong Kong.

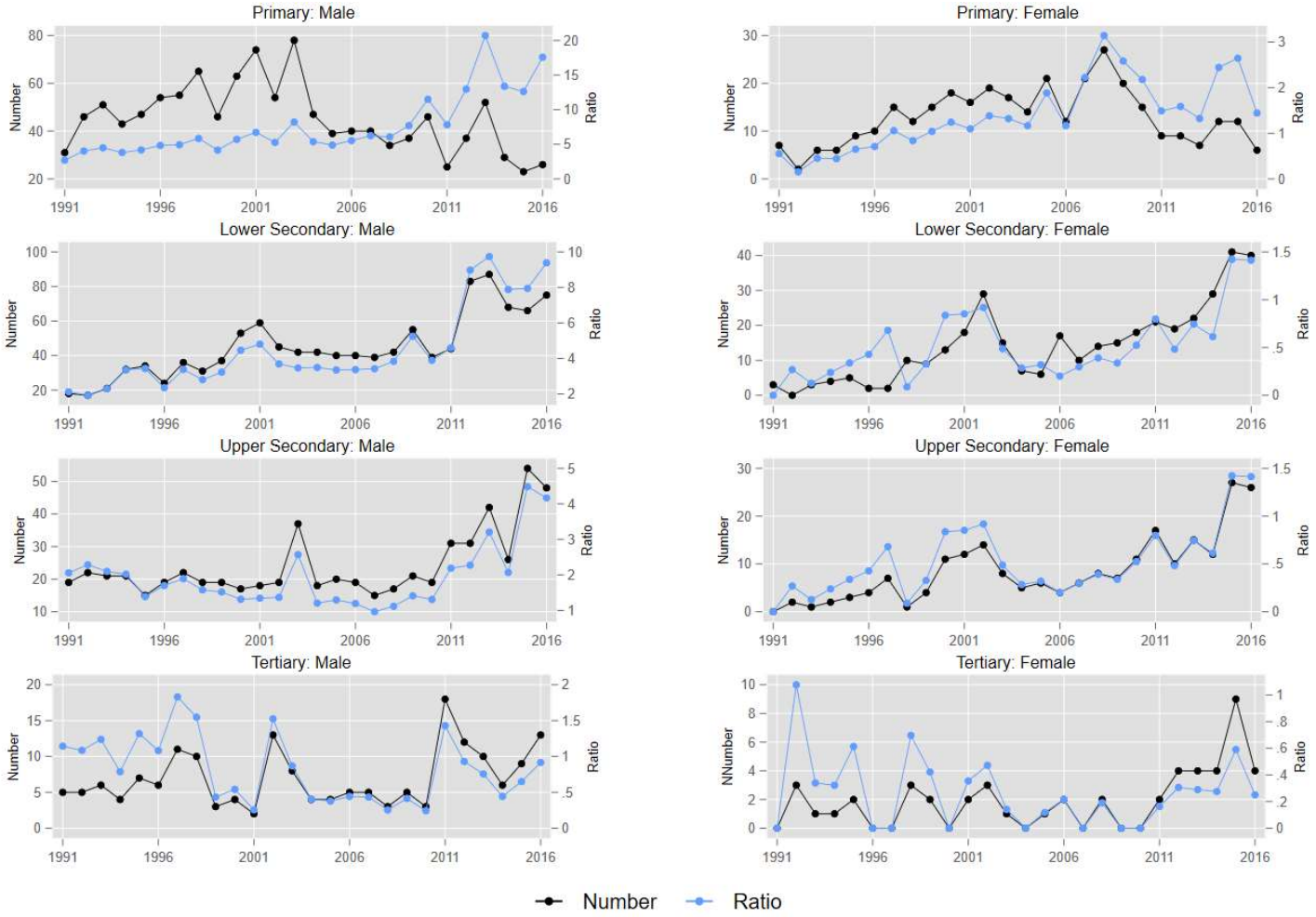
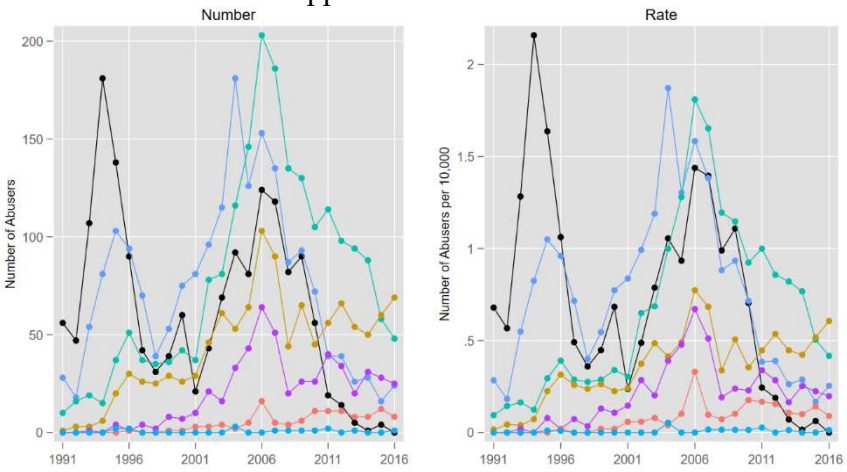
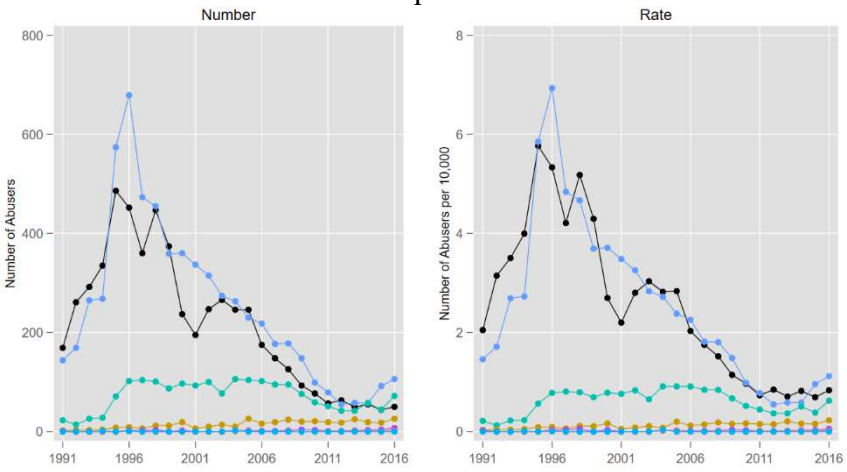


Figure 6. New Drug Abusers by Education at Age 40-50

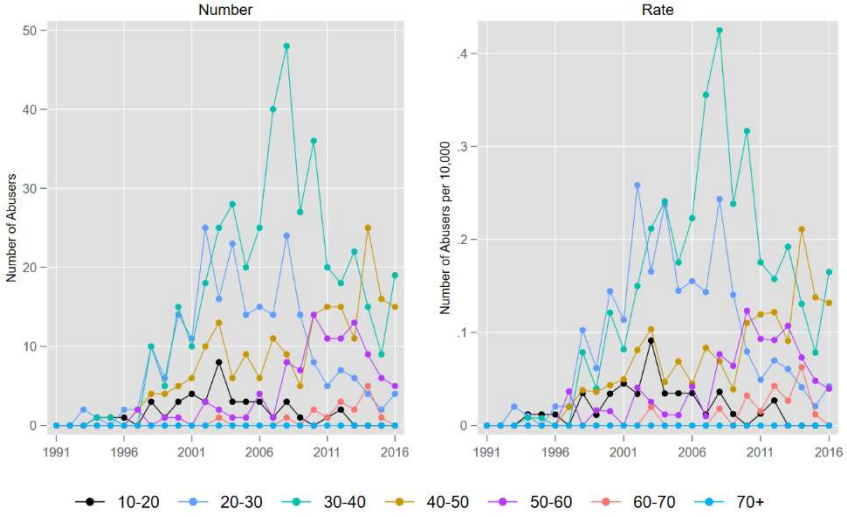
Note: Newly reported drug abusers by gender and educational attainment were shown. Females and males are on the left and right panel, respectively. The people are aged 40-50.



a. Tranquillizers



b. Hallucinogens



c. Sedatives/Hypnotics

Figure S1. Number and Rate of Abusers by Other Drug Type

Note: Number and rate of drug abusers by age-group are plotted for tranquillizers, hallucinogens, and sedatives/hypnotics respectively.

Chapter 2. Improving Targeted Interventions for Drug Abusers in Hong Kong: A Quantitative Analysis of Demographics and Socioeconomics

Abstract

Drug abuse is a critical and challenging issue globally, but there is a lack of thorough understanding of the trends and underlying mechanisms of drug abuse which is essential for social interventions, in many threatened places such as Hong Kong. This study adopts multiple linear regression models to examine the determinants of drug abuse in Hong Kong based on the most comprehensive data on drug use and population from 1991 to 2016. We find that demographic and socioeconomic characteristics are important predictors of drug abuse. Specifically, higher drug abuse rates are observed for the less-educated group below the upper secondary level, for males, for the young and middle-aged people, and for poorer districts compared with their counterparts. If monthly average income increases by HKD 10,000 (58%), drug use rate will drop by 22 per 10,000 people in a district (82%). Illicit drugs with lower prices and addiction costs are more popular among the young people. Expenditures on drug abuse in Hong Kong were further calculated as a measure of drug use costs. The findings shed lights on health and social policymaking in tackling drug abuse in Hong Kong and other societies with similar issues in population ageing and drug abuse.

Keywords: drug abuse; demography; education; income; ageing; Hong Kong

1. Introduction

Drug abuse imposes substantial costs on the individuals and society, including health damages, labor and wage losses, drug-related violence and crimes, widely in both developed and developing countries (e.g., Deykin et al., 1987; Dobkin and Nicosia, 2009; Liu et al., 2006; Martikainen et al., 2018; McGrath and Chan, 2005; Móró et al., 2013; Ng et al., 2010; Nutt et al., 2007; Shek et al., 2011). Tackling drug abuse is universally challenging due to addiction and huge profits of drug supply. Recently, there is a growing trend in drug production in regions such as Golden Triangle in Southeast Asia,[5] and recreational drug use is decriminalized in parts of North America,[6] potentially affecting a large population worldwide.

A clear and up-to-date understanding of drug use patterns and changes by sub-population is critical for health and social care policy targeted at reducing drug abuse and catering for varying needs of different groups (e.g., Arat et al., 2016; Botvin 2000; Chein et al., 1964; McHugh et al, 2015; Pollack et al., 2002; Quinn, 2010). An extensive literature has explored the causes of drug abuse and its interventions, including the roles of economic activity, education, drug and alcohol prices, legislation, law enforcement and rehabilitation programs (e.g., Bachman et al., 2007; Becker and Murphy, 1988; Botvin et al., 1995; Chu, 2014; Corman and Mocan, 2000; DeNardo and Lemieux, 2001; Deng et al., 2007; DeSimone and Farrelly, 2003; Järvinen, 2017; Kerrison, 2018; Saffer and Chaloupka, 1998; Schuermeyer et al., 2014; Williams, 2004). Still, observations are limited and insufficient for evidence-based policymaking in many regions. In particular,

[5] https://www.reuters.com/article/uk-myanmar-drugs/golden-triangles-drug-production-expands-diversifies-amid-opioid-concerns-idUKKCN1NC0AQ.
[6] https://www.independent.co.uk/news/world/americas/canada-marijuana-legal-drug-cannabis-reform-justin-trudeau-a8409046.html.

evidence on the relationship between socioeconomic conditions and drug abuse is mixed worldwide (e.g., Long et al., 2014; Saffer and Chaloupka, 1999), and the relationship is empirically unclear in Hong Kong. Hong Kong connects the Golden Triangle with international markets of illicit drugs, and has been facing threats for decades. Despite the overall decline in reported drug abuse cases in recent years, challenges remain in identifying at-risk groups and local determinants of drug abuse (Census and Statistics Department, 2016; Cheung & Ch'ien, 1996; Wu et al., 2014). Previous studies focused on the characteristics of drug abusers using limited survey data (Abdullah et al., 2002; Cheung and Cheung, 2006; Loxton et al., 2008; Tse et al., 2016), or explored the trends in the number of drug abusers (Cheung and Cheung, 2018; Joe Laidler, 2005). However, given the rapidly ageing population in Hong Kong, such quantitative analyses shall take into account the changes in population over time (which received little attention) to consistently measure and compare drug abuse rate by population besides the absolute numbers (Kandel, 1991; Liu and Gietel-Basten, 2019).

This paper is among the first to quantitatively examine the relationship between drug abuse rate and various demographic and socioeconomic factors in Hong Kong. We exploit the most representative data on drug abusers in Hong Kong for a long period from 1991 to 2016, allowing us to examine the historical and latest changes in drug abuse. Importantly, we take into account the population changes (such as population ageing) in the long run, which have been overlooked in the academic literature, social policy and practice. We first construct drug abuse rates by various categories such as age, gender, education and district. Then, we exploit multiple linear regression models to quantify the differentials in drug abuse by demographic and socioeconomic factors. We further estimate the cost of drug abuse by drug expenditure. The study can help understand the

situation, trends and determinants of drug abuse over time and space, which is crucial for improving targeted interventions on drug abuse and further protecting public health and improving social welfare in Hong Kong. The analyses and findings can also contribute to the literature on drug abuse with novel evidence from Hong Kong, which provides reference for other regions with similar issues in population ageing and drug abuse such as Taiwan (Lin 2010).

The remainder of the paper is as follows. Section 2 describes our drug use and census data. Section 3 illustrates our methods on constructing drug abuse rate and quantifying the determinants. Section 4 reports our findings. Section 5 offers further discussions and concludes.

2. Data

2.1 Drug Abuse

The drug abuse data were provided by Central Registry of Drug Abuse (CRDA) at Narcotics Division (ND) in Hong Kong (Wat, 1985). Drug abuse is defined as the taking of substance that harms or threatens to harm the physical, mental or social wellbeing of an individual, in doses above or for periods beyond those normally regarded as therapeutic (Census and Statistics Department, 2016). Reporting agencies in the CRDA system include governmental departments (such as the police, hospitals, correctional services, etc.), non-government organizations (NGOs, such as Drug Treatment and Rehabilitation Centres, Counselling Centres for Psychotropic Substance Abusers, Centres for Drug Counselling, etc.), and schools. The information collected includes demographics (such as age, gender, education, economic activity, district of residence)

and type of drugs used by each drug abuser.[7] CRDA assigns a case number to each drug abuser, whom can be reported multiple times over time and space. In total, there were 666,665 cases from 98,016 drug abusers reported during 1991-2016 in Hong Kong.

A universal concern with all the studies on drug abuse is the potential under-reporting of drug-abusing population. Nevertheless, the under-reporting ratio in CRDA is expected to be lower than 10% (Narcotics Division, 2011). Recent scientific studies using wastewater to measure drug use also find consistent patterns with the CRDA data in Hong Kong (Lai et al., 2013). In addition, there is no evidence of systematic bias in under-reporting of particular groups in the CRDA. Therefore, it will not alter the coefficients from linear regression models. In general, CRDA data is representative of the overall drug abuse situation in Hong Kong.

2.2 Census

The Hong Kong Census data cover 5% of the population every 5 years. Our census data overlap with the CRDA data from 1991 to 2016, and report key demographic and socioeconomic characteristics similarly. Since the information on district of residence was unavailable in 1991 due to confidentiality concerns, our analysis on the drug abuse rate by district is focused on the period 1996-2016.

3. Methods

3.1 Construction of Drug Abuse Rate

We compare the number of drug abusers with the population data, the latter of which were interpolated linearly in-between each census point to obtain annual estimates of

[7] The most popular drugs are narcotics analgesics (opium, heroin, etc.), stimulants (methamphetamine, cocaine, etc.) and ketamine.

population in Hong Kong during 1991-2016. The population data were then matched with CRDA drug use data by demographic characteristics (age, gender, education, residence) in each year, allowing for calculating the rate of drug abuse by these specific groups. We then examine the changes in rates of drug abuse for each group or stratification.

It is worth noting that both the absolute number and rate of drug abuse are important from the perspectives of social policy and welfare. The number measures the overall severity of drug abuse, whereas the rate reveals the relative severity of drug abuse across different groups, thus is more suitable for consistent comparison over time and space.

3.2 Multiple Linear Regression

3.2.1 Demographic Determinants

In order to explore how the drug abuse rate differs by demographics such as age, gender and education, we employ the following equation:

$$Y_{it} = \alpha_0 + \beta_0 Age_{it} + \beta_1 Gender_{it} + \beta_2 Edu_{it} + \xi_{it} \quad (1)$$

where Y_{it} is the rate of drug abuse in group *i* in year *t*. Age_{it}, $Gender_{it}$ and Edu_{it} denote the age, gender and educational attainment of group *i*. Specifically, Age_{it} includes 10-year bins of age by [0, 10), [10, 20), [20, 30), [30, 40),. [40, 50), [50, 60), [60, 70), and [70,). The age group between 0 and 10 years old is used as the reference group, since they are unlikely to take illicit drugs as shown by the drug use data. Therefore, the vector β_0 captures the relative difference in drug abuse rate between each age group and the reference group (which is zero). β_1 reveals the gender difference between males and females using males as the reference group. Similarly, Edu_{it} categorizes educational attainment into five bins: no schooling/kindergarten, primary education, lower secondary education (S1-S3), upper secondary education (S4-S7), and tertiary education. No

schooling/kindergarten is the reference group, and β_2 reports the difference in drug abuse rate between group i and the reference group. Since people with no schooling/kindergarten are more likely to take illicit drugs than other groups, we expect β_2 to be negative. Lastly, all the coefficients may be different by drug category. Hence, we also report the age differences for each drug category, respectively. α_0 is the intercept, and ξ_{it} is the residual term.

3.2.2 Economic Determinants

We leverage income information to explore the economic determinants of drug abuse. Income can be calculated from the monthly earnings reported by each individual in the Census and were aggregated by group. Different from Equation (1), we construct a panel of drug abuse rates by district and year. Since we do not have information on people who do not take drugs as counterfactuals, aggregation above the individual level is necessary for analysis. The finest spatial resolution in the CRDA data is by district. Therefore, we calculate the number and rate of drug abuse at the district-year level. There are 18 districts in Hong Kong, with a large heterogeneity across districts in many aspects, including drug abuse rate, income and economic structure.

We estimate the effect of income on drug abuse rate by district as follows:

$$Y_{dt} = \alpha_1 + \beta_3 Income_{dt} + \tau_d + \pi_t + \xi_{dt} \quad (2)$$

where Y_{dt} is the drug abuse rate in district d in year t. $Income_{dt}$ denotes the monthly average income of residents in district d in year t. β_3 is the parameter of interest, which captures the effect of income on drug abuse rate. τ_d denote district fixed effects, which controls for time-invariant factors that are specific to a district (such as economic structures and patterns). It also reports the differences in drug abuse rate across districts. π_t are the year fixed effects which control for temporal changes that are common to all

districts in Hong Kong, such as major changes in the economy, policy and overall drug supply to Hong Kong that affect all the districts at the same time. Equation (2) is a fixed-effects panel regression model, allowing us to explain the income effect and district differences by controlling for much of the unobserved confounders that are either time-invariant and district-specific (such as natural endowment) or common to all districts. Although the fixed-effects models are still likely associational, they can presumably explain a large proportion of the variations in drug abuse rate. Thus, they can credibly help quantify the relationship between drug abuse and demographic/socioeconomic factors.

4. Results

4.1 Drug Abuse by District

Table 1 reports the numbers, percentage shares, and ratios of drug abusers by district in Hong Kong in each census year during 1996-2016. The districts are ranked by the numbers of drug abusers in 2016. Drug abusers with no information on district of residence were dropped.

First, we observe both a large number and rate of drug abusers in districts with higher population densities (including Sham Shui Po and Yau Tsim Mong), but there are notable differences revealed by the two metrics. For example, although Kwun Tong also has a high share of drug abusers each year (around 10%), the rate of drug abuse is almost half of that in Sham Shui Po (16 *vs* 29 per 10,000 in 2016). This is due to the fact that Kwun Tong has a much larger population than Sham Shui Po. Therefore, the severity of drug use is much higher in Sham Shui Po than the absolute numbers suggest. We highlight this difference for social policy design to allocate much more resources to Sham Shui Po

than those to Kwun Tong. Second, drug abusers are also likely to reside in remote and poorer areas with high criminal records, such as Yuen Lung.[8] In comparison, the prevalence of drug abuse is low in commercial regions with financial and real estate industries on the Hong Kong Island, such as Central/Western and Wan Chai. The average wages in these regions are higher than those in Kowloon (including Sham Shui Po and Yau Tsim Mong). For instance, the monthly average incomes in Wan Chai, Sham Shui Po and Yau Tsim Mong are HKD 26,643, 15,171 and 17,237, respectively during 1996-2016. Third, the number and rate of drug abusers were declining in the hotspots and other districts universally after 2001, except for Yuen Long, Kwai Tsing, and Islands which witnessed an increase from 2006 to 2011.

[Table 1]

4.2 Reason of Drug Abuse

Effective and efficient social policy and interventions require timely and accurate understanding of the reasons behind individual decisions on drug abuse. One advantage of the CRDA data is that it reports reasons for drug use for each individual since 1996. The main reasons include: curiosity, peer influence, partner influence, relief of boredom/depression/stress, self-medication, to avoid discomfort of its absence, to seek euphoria or sensory satisfaction. Overall, we find that peer influence (30%), curiosity (28%) and discomfort (19%) are the top three reasons for taking illicit drugs. Importantly, the primary reasons behind drug abuse differ by age. First, curiosity (35%) and peer influence (32%) play a dominant role for drug abuse among the young people below 30 years old. Second, as the age increases, discomfort becomes a more important driver for drug use decisions. For middle-aged groups between 30 and 60 years old, peer influence

[8] https://www.scmp.com/article/620541/crime-map-reveals-citys-black-spots.

(29%) and discomfort (24%) are the main reasons. Notably, the share of relief of boredom/depression/stress for the middle-aged group is higher than those of the young and elderly. This reveals that social pressure and anxiety, which is also likely related with discomfort, may play a significant role in introducing new drug use for the middle-aged people. Third, over 37% of the elderly above 60 takes drugs to relieve discomfort in health. This suggests that the elderly is unlikely to take illicit drugs due to curiosity or pressure. The percentage of reasons for each group are plotted in Figure 1.

[Figure 1]

The reasons for drug abuse also vary by educational attainment. The top reasons for no-schooling, primary, lower-secondary, upper-secondary, and tertiary groups are: to avoid discomfort (37%), peer influence (29%), peer influence (31%), peer influence and curiosity (59%), relief of boredom/depression/stress (27%), respectively. In sharp contrast, physical discomfort is the main reason for the no-schooling group, whereas mental depression is the major cause for the well-educated group.

In light of the above, drug policies and programs shall differentiate their attention by age and educational attainment. For example, previous social work and policies primarily focus on the young people and develop various education programs to discourage curiosity and peer influence. As Hong Kong is well-known for high social pressure, social work shall focus more on relieving boredom and stress for the middle-age people to prevent drug use at an early stage. As for the elderly, more health and medical programs shall be devoted to reducing the physical discomfort.

4.3 Gender, Age and Education

Previous studies observed higher prevalence of illicit drugs among males, the youth and less-educated groups, but the importance of gender, age and education is not quantified

in Hong Kong. Table 2 reports our estimates from Equation (1). Males, age group at 0-10, and people with no schooling are used as the reference groups to compare the differences in drug abuse over gender, age and education, respectively. Column (1) contains the estimates for all drug abusers, and columns (2)-(3) differentiate between newly addicted (or drug initiation) and previously addicted cases. On average, the drug abuse rate of women is lower than that of men by around 60 per 10,000 in Hong Kong. Female drug abuse rate is nearly 15 people fewer than males for the new-addiction cases, and is 46 people fewer than males for previously addicted cases. All the estimates are statistically significant at the 1% level ($p<0.01$).

Age is another key factor of drug abuse decision. People aged between 20 and 30 have the highest drug abuse rate over 137 per 10,000, followed by age groups at 30-40, 10-20 and 40-50. The youth at age 10-20 is much more likely to start taking illicit drugs than those older than 30, as shown by column (2). In addition, the last four rows in Table 2 show the differences in drug abuse rates by educational attainment, conditional on gender and age. The highest rate is observed for people with primary education, which is 17 counts per 10,000 more than those with no schooling. The tertiary group has the lowest drug abuse rate. There is a negative correlation between education and new drug use in column (2), suggesting that higher education reduces the likelihood of drug use. A plausible explanation is that drug abuse brings higher private costs to individuals with higher education, such as opportunity and productivity losses.

[Table 2]

The drug abuse rates may also be heterogeneous by different drugs. Table 3 represents the estimates of each demographic factor's association with drug abuse rate in each age group. First, the relationship between narcotics analgesics use and age is concave

downward, with the largest rates in the age group at 40-50 in column (1). Compared with the age-group below 10 years old with no drug abuse, the drug abuse rate of narcotics analgesics is higher by 7 per 10,000 for the youth between 10 and 20 years old. The concave relationship is also found for sedatives/hypnotics in column (5). The abuse rate of other drugs, including stimulants, depressants, tranquillizers, hallucinogens and ketamine, all reveal monotonically decreasing associations with age. Furthermore, narcotics analgesics are the most popular drugs, with much larger coefficients than many other drugs for each age group. The size of drug abuse rate among the youth at age 10-20 is also large for stimulants and ketamine, revealing a high popularity of these drugs among the youth. This may be related with the common "misconception" of many drug abusers that ketamine does less physical harm compared with other drugs, and it is more affordable with lower prices (Joe-Laidler and Hunt, 2008).

[Table 3]

The quantified relationships between the usage of different drugs, gender, age and education provide support for policy designs along multiple dimensions. For instance, the differences in drug abuse rates are informative for prioritizing resources to target at most at-risk groups, such as people aged between 20 and 30 and people with only primary education. For the youth aged between 10 and 20, regulations shall be strengthened for stimulants, depressants and ketamine compared with other drugs. The numbers also provide the basis for cost-benefit analyses of existing and future interventions, which is beyond the scope of this paper.

4.4 Income

Economic status is closely related with drug abuse decisions, but the relationship can be either positive or negative (e.g., Long et al., 2014; Saffer and Chaloupka, 1999). On the

one hand, higher incomes may increase consumption of drugs for pleasure, but may also increase investment on health as a normal good and reduce drug use. On the other hand, drug abuse can dampen work productivity and income. Since drug use and income can affect each other, there is an issue of reverse causality in identifying the effects of income on drug use. Despite the challenges, the drug-income relationship is empirically unclear in Hong Kong. To explore the association between income and drug abuse, we run the regression in Equation (2), and report the estimates in Table 4. If we simply regress drug abuse rate on income, the coefficient is -0.0015, with a statistical significance lower than 1%. In other words, if monthly income increases by HKD 10,000 (USD 1,278), the drug use rate will significantly decrease by 15 per 10,000 people in a district. Introducing district fixed effects greatly improved the R-squared (goodness of fit) from 0.27 to 0.88, as shown by columns (1) and (2), and the size of the income coefficient almost doubled. This suggests that the omitted time-invariant spatial differences in drug abuse can explain a large proportion of drug abuse variation. Further controlling for year fixed effects yields to similar estimates of the income effect while continuously improving the R-squared to 0.92, as shown by column (3). Our method can explain 92% of the variation in drug abuse at district level. Hence, we use this as our main specification. The yearly differences estimated in the same regression in column (3) are reported in column (6), with the year 1996 as the reference group. Drug abuse rates were declining from 1996 to 2016, with a few spikes in 2000-2002 and 2008-2009. In addition, we further differentiate between newly addicted and previously addicted cases in columns (4)-(5). Overall, the estimates in columns (3) to (5) shows that if monthly income increases by HKD 10,000 in a district, the drug abuse rate will decrease by 22 people per 10,000, among which 9 are newly addicted cases, and 13 are previously reported drug abusers. The average drug abuse rate

at the district level is 27 per 10,000, and the average monthly income in a district is HKD 17,147 (USD 2,191). This means that a 58% increase in monthly income is associated with an 82% drop in drug abuse rate at the district level.

Table 4 also reports the spatial differences in drug abuse rates by district conditional on income, with Central/Western as the reference group. If incomes in all districts are at the same level, the highest drug abuse rate would be in Yau Tsim Mong, which is 12 per 10,000 people higher than that in Sham Shui Po. It is worth noting that Sham Shui Po has the highest observed drug abuse rate listed in Table 1. These two observations do not contradict each other. Instead, Table 4 serves as the counterfactual of what the drug abuse rate would be like if the income differences across districts disappear. Moreover, the drug abuse rate in Yau Tsim Mong is driven by the previously addicted cases, whereas the highest rates of new addiction are in Wan Chai and Central/Western. These spatial differences are related with unobserved time-invariant factors at the district level.

[Table 4]

4.5 Cost of Drug Abuse

CRDA covers valuable information on the frequency and cost of drug use of each individual since 2006. This information is self-reported by drug abusers during 2006-2016. On average, each individual takes drugs around 14 times per year. The average annual expense on illicit drugs for an individual is HKD 28,555 (USD 3,650). The average annual income of an individual is HKD 128,310 (USD 16,400) during 2006-2016. This means that a drug abuser can spend at least 22% of income on illicit drugs each year. This is a lower-bound estimate, since the income of drug users is likely lower than other people. In addition, the expense-age relationship follows an inverted-U shape. People aged

between 40 and 50 pay the most for drugs, which is around HKD 35,492 (USD 4,536) per year. A person at 10-20 years old spends HKD 10,649 (USD 1,360) a year on illicit drugs, and a person at 70-80 years old spends HKD 26,074 (USD 3,332) a year on illicit drugs. The observed total annual expenditure or cost on drug use is HKD 255 million (USD 32.6 million) in Hong Kong on average. It is worth noting that other costs by drug use, such as health expenditure and labor losses (DeSimone, 2002), are difficult to observe and are neglected in the cost calculation.

The quantitative analyses and findings above in Sections 4.4 and 4.5 can be used as reference for cost-benefit calculations in social work and policies. In addition, the estimates based on drug abuse rate can also be compared with other regions if the same analysis is conducted.

5. Discussion and Conclusion

Understanding the determinants of drug abuse is crucial for the design and implementation of social policy interventions. This study explores the demographic and socioeconomic differentials of drug abuse in Hong Kong during 1991-2016. Using the most comprehensive data on drug abuse and population in Hong Kong, we isolate the effects of population changes in the long run by constructing rates of drug abuse by sub-population. We find that drug abuse is adversely related with education and income levels, and the youth and males have higher drug abuse rates than their counterparts. The relationships are further quantified for each type of drugs in every Hong Kong district, together with the expenditure on drugs as a lower-bound measure of the costs associated with drug abuse.

There are a few caveats in interpreting the findings. First, there is potential under-reporting as mentioned in the data section. Second, we use linear interpolation to construct measures of drug abuse rate for each year in-between the census points, which may induce measurement error. These potential errors, however, will not bias our estimates largely, since they are likely uncorrelated with the characteristics of specific subgroups. Third, the multiple linear regression models capture only the average associations between income and drug abuse. Therefore, our estimates shall be interpreted as the average effects of demographic and socioeconomic determinants on the observed drug abuse rate in Hong Kong.

Our findings are helpful for governmental and non-governmental programs to allocate resources effectively to target at those most at-risk groups in Hong Kong, such as people with education below the upper secondary level, and the youth below 20 years old using stimulants and ketamine, and the middle-aged using narcotics analgesics. In particular, we call for policy attentions to poor families who are likely to reduce drug use if their incomes increase. The findings provide important insights in social work and policy related with drug abuse. More research can be done in the future to evaluate the effectiveness of policy interventions, and to offer insights on improving policy treatment and social care to discourage drug abuse in Hong Kong and other regions with drug abuse and ageing issues.

Table 1. Number and Rate of Drug Abusers in Hong Kong Districts

	Number					Percentage (%)					Rate (per 10,000)				
District	1996	2001	2006	2011	2016	1996	2001	2006	2011	2016	1996	2001	2006	2011	2016
All	19,170	17,874	12,691	10,996	7,570						39.2	35.7	25.7	21.4	14.0
By District															
Sham Shui Po	1,787	1,656	1,322	1,194	874	9.3	9.3	10.4	10.9	11.5	61.6	61.9	48.4	42.2	29.4
Kwun Tong	2,294	1,799	1,248	993	768	12.0	10.1	9.8	9.0	10.1	49.2	42.4	28.3	21.5	16.1
Yau Tsim Mong	1,766	1,584	1,184	877	725	9.2	8.9	9.3	8.0	9.6	84.9	74.3	56.9	38.4	28.8
Yuen Long	1,156	1,268	928	1,120	713	6.0	7.1	7.3	10.2	9.4	42.8	37.4	23.4	26.2	15.8
Kwai Tsing	984	1,110	793	838	584	5.1	6.2	6.2	7.6	7.7	26.3	30.8	20.3	21.9	15.3
Tuen Mun	1,686	1,407	1,054	827	566	8.8	7.9	8.3	7.5	7.5	45.2	38.6	28.2	22.8	15.7
Wong Tai Sin	1,777	1,426	899	634	456	9.3	8.0	7.1	5.8	6.0	56.4	42.1	28.6	20.3	14.6
Sha Tin	1,001	1,046	789	618	404	5.2	5.9	6.2	5.6	5.3	21.5	21.9	17.3	13.0	8.2
North	705	776	643	661	384	3.7	4.3	5.1	6.0	5.1	38.3	34.3	30.5	29.3	16.6
Eastern	1,186	1,064	665	588	380	6.2	6.0	5.2	5.3	5.0	25.2	22.9	15.2	13.4	9.3
Kowloon City	871	872	463	366	310	4.5	4.9	3.6	3.3	4.1	29.0	30.5	17.1	13.0	10.0
Tsuen Wan	1,009	845	509	381	275	5.3	4.7	4.0	3.5	3.6	46.5	42.4	24.0	16.8	11.7
Tai Po	739	753	579	531	288	3.9	4.2	4.6	4.8	3.8	32.6	32.2	27.0	24.8	13.1
Sai Kung	340	492	349	329	259	1.8	2.8	2.7	3.0	3.4	21.7	19.7	11.5	10.3	7.6
Islands	182	158	245	330	209	0.9	0.9	1.9	3.0	2.8	36.2	21.0	24.7	30.4	18.2
Southern	825	773	555	374	187	4.3	4.3	4.4	3.4	2.5	36.3	35.9	27.5	18.2	9.1
Wan Chai	453	405	247	156	117	2.4	2.3	1.9	1.4	1.5	33.0	31.6	21.3	13.8	8.8
Central/Western	409	440	219	179	71	2.1	2.5	1.7	1.6	0.9	19.6	22.0	11.9	9.6	4.0

Note: The number, percentage share and rate of drug abusers (per 10,000) in 18 districts of Hong Kong are shown on the left, middle and right panel, respectively. Observations with no district information were dropped.

Table 2. Difference in Drug Abuse Rate by Gender, Age and Education

VARIABLES	(1) All	(2) New	(3) Previous
Gender			
Female	-60.44***	-14.87***	-45.57***
	(3.18)	(1.55)	(2.17)
Age			
10-20	66.72***	35.82***	30.90***
	(7.08)	(4.69)	(4.39)
20-30	137.23***	48.87***	88.35***
	(8.83)	(3.53)	(6.15)
30-40	95.72***	21.86***	73.86***
	(7.97)	(3.96)	(5.30)
40-50	64.21***	9.85***	54.36***
	(4.66)	(1.64)	(3.98)
50-60	44.78***	7.46***	37.32***
	(4.19)	(1.60)	(3.30)
60-70	33.32***	7.08***	26.23***
	(4.29)	(1.60)	(3.26)
>=70	26.93***	6.94***	19.99***
	(4.52)	(1.60)	(3.45)
Education			
Primary	17.21***	-7.01**	24.22***
	(6.13)	(3.41)	(3.99)
Lower secondary	8.83	-4.15	12.98***
	(5.92)	(3.52)	(3.63)
Upper secondary	-44.92***	-17.54***	-27.39***
	(5.02)	(3.38)	(2.78)
Tertiary	-56.88***	-22.35***	-34.53***
	(5.26)	(3.44)	(2.97)
Observations	1,919	1,919	1,919
R-squared	0.39	0.23	0.42

Note: The differences in drug abuse rate by gender, age, and education are listed in each panel. Results on all drug abusers, newly reported abusers, and previously reported abusers are listed in each column. The males, age group at 0-10, and people with no schooling/kindergarten are the reference groups, respectively. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3. Drug Abuse Rate by Drug Type and Age

VARIABLES	(1) Narcotics Analgesics	(2) Stimulants	(3) Depressants	(4) Tranquillizers	(5) Sedatives/ Hypnotics	(6) Hallucinogens	(7) Other (Ketamine)
10-20	7.33***	9.73***	0.12***	0.92***	0.02***	3.16***	8.92***
	(1.97)	(1.44)	(0.03)	(0.13)	(0.01)	(0.37)	(1.67)
20-30	27.34***	6.82***	0.03***	0.98***	0.12***	3.19***	10.61***
	(3.58)	(0.82)	(0.01)	(0.12)	(0.02)	(0.41)	(1.86)
30-40	29.05***	2.59***	0.01***	0.89***	0.19***	0.79***	2.62***
	(1.72)	(0.48)	(0.00)	(0.13)	(0.03)	(0.07)	(0.50)
40-50	29.32***	0.96***	0.00***	0.48***	0.09***	0.15***	0.44***
	(2.41)	(0.26)	(0.00)	(0.05)	(0.01)	(0.02)	(0.09)
50-60	21.88***	0.25***	0.00	0.27***	0.05***	0.02***	0.09***
	(1.15)	(0.06)	(0.00)	(0.05)	(0.01)	(0.00)	(0.02)
60-70	11.86***	0.04***	0.00	0.10***	0.01***	0.00	0.02***
	(0.50)	(0.01)	(0.00)	(0.02)	(0.00)	(0.00)	(0.01)
>=70	2.31***	0.00	0.00	0.01***	0.00	0.00	0.00**
	(0.20)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	208	208	208	208	208	208	208
R-squared	0.61	0.56	0.38	0.48	0.41	0.65	0.45

Note: The differences in drug abuse rates by drug type and age are reported. The age group at 0-10 is the reference group. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4. Rate of Drug Abuse by Income and District (per 10,000)

VARIABLES	(1) All	(2) All	(3) All	(4) New	(5) Previous	Year	(6) All
Income (HKD)	-0.0015***	-0.0027***	-0.0022***	-0.0009***	-0.0013***	1997	-3.85*
	(0.0001)	(0.0001)	(0.0004)	(0.0001)	(0.0003)		(2.00)
Wan Chai		8.01***	7.74***	0.89**	6.84***	1998	-4.58**
		(1.56)	(1.34)	(0.43)	(1.12)		(1.97)
Eastern		-16.90***	-12.80***	-6.05***	-6.75***	1999	-5.06***
		(1.54)	(2.98)	(0.94)	(2.40)		(1.95)
Southern		-4.53***	-1.22	-1.52*	0.31	2000	-0.44
		(1.43)	(2.50)	(0.79)	(2.02)		(1.94)
Yau Tsim Mong		18.83***	24.00***	0.88	23.12***	2001	1.09
		(2.15)	(4.08)	(1.07)	(3.44)		(2.00)
Sham Shui Po		5.37***	11.74***	-5.40***	17.15***	2002	-0.14
		(2.07)	(4.46)	(1.41)	(3.62)		(2.13)
Kowloon City		-14.00***	-9.73***	-5.84***	-3.89	2003	-4.54**
		(1.54)	(3.08)	(0.99)	(2.49)		(1.95)
Wong Tai Sin		-19.11***	-11.37**	-9.73***	-1.64	2004	-6.68***
		(2.33)	(5.46)	(1.67)	(4.47)		(2.04)
Kwun Tong		-17.98***	-10.72**	-8.31***	-2.41	2005	-8.54***
		(2.34)	(5.17)	(1.58)	(4.21)		(1.78)
Kwai Tsing		-27.27***	-19.57***	-8.84***	-10.73**	2006	-10.24***
		(2.04)	(5.28)	(1.67)	(4.25)		(1.76)
Tsuen Wan		-12.59***	-7.15*	-6.07***	-1.08	2007	-8.66***
		(1.94)	(3.89)	(1.25)	(3.14)		(1.89)
Tuen Mun		-19.80***	-12.32**	-7.95***	-4.37	2008	-5.82***
		(2.03)	(5.14)	(1.64)	(4.13)		(2.00)
Yuen Long		-17.92***	-10.86**	-5.29***	-5.56	2009	-5.30**
		(1.95)	(4.85)	(1.52)	(3.92)		(2.24)
North		-16.25***	-9.06*	-4.39***	-4.68	2010	-7.60***
		(1.90)	(4.96)	(1.62)	(3.99)		(2.26)
Tai Po		-16.84***	-10.62**	-4.98***	-5.65	2011	-7.94***
		(1.82)	(4.33)	(1.38)	(3.49)		(2.42)
Sha Tin		-23.25***	-17.80***	-7.19***	-10.61***	2012	-7.18***
		(1.78)	(3.88)	(1.20)	(3.14)		(2.54)
Sai Kung		-25.58***	-20.19***	-7.43***	-12.76***	2013	-7.35***
		(1.98)	(3.96)	(1.21)	(3.20)		(2.73)
Islands		-8.04***	-3.78	-0.83	-2.96	2014	-8.59***
		(1.72)	(3.39)	(1.18)	(2.72)		(2.89)
						2015	-7.43**
							(3.20)
						2016	-7.51**
							(3.38)
Observations	378	378	378	378	378		378
R-squared	0.27	0.88	0.92	0.83	0.92		0.92
District FE		Y	Y	Y	Y		Y
Year FE			Y	Y	Y		Y

Note: Central/Western and the year 1996 are the reference groups. Columns (3) and (6) are from the same regression. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

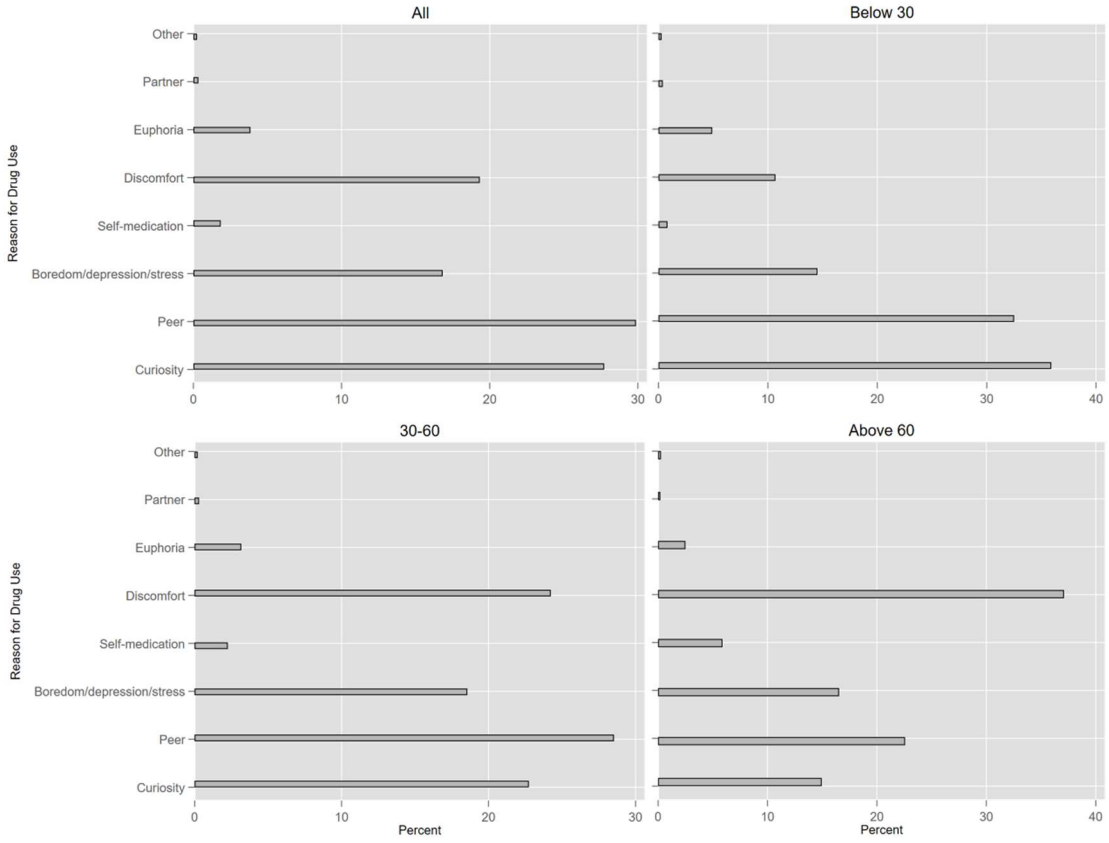


Figure 1. Percentage Shares of Drug Abuse Reasons

Note: The reasons for drug abuse are shown for the whole population, age 0-30, 30-60 and 60 above in the upper left, upper right, lower left and lower right panel, respectively.

Chapter 3. Multi-national Comparison of Drug Abuse Trends and Policy: What Can Be Learnt for Hong Kong?

Abstract

This study aims to provide a comprehensive review on the drug abuse situation and relevant policies in different regions around the world based on the scholarly literature and public reports. Instead of a systematic review on the whole universe of literature, we primarily collect evidence to support drug policy design and implementation in Hong Kong. In particular, we focus on specific at-risk groups identified in Hong Kong, such as the youth, female, low-income and low-education households, and investigate how policies in other places respond to changes in drug abuse trends and challenges such as population ageing. Although the drug abuse rate is relatively lower in Hong Kong than those in many other regions, continuous efforts are required to cater for various needs, particularly for the middle-aged and specific young people. The similarities and differences in drug policies and practices provide useful reference for Hong Kong.

Keywords: drug abuse, drug policy, ageing, Hong Kong

1. Introduction

Drug abuse impairs physical health (including HIV infection and AIDS), mental health (such as psychosis comorbidity), work productivity, and drug-related crimes impose high costs to other people in the society. Illicit drug use is prevalent in many countries such as United States, China, Japan and India (e.g., Abdullah et al., 2002; Arat et al., 2016; Bachman et al., 2007; Nadeem et al., 2009). In recent years, drug abuse is becoming widespread and more challenging in some regions due to an expansion in drug supply and the introduction of new drugs which are difficult to detect. Other social issues such as international migration and population ageing complicates the situation in drug abuse in areas such as Hong Kong. This calls for more policy efforts to restrain drug abuse or misuse effectively and efficiently.

Conceptually, drug abuse is determined by the supply and demand of illicit drugs. However, it is empirically challenging to causally quantify the specific determinants of drug abuse. Cross-regional comparisons can benefit our understanding on the local and regional drivers of drug abuse. Furthermore, understanding the commonalities and differences between different regions are helpful for policy design and implementation. Specifically, what can be learnt from other regions for Hong Kong, and what can Hong Kong contribute to the understanding and practice of anti-drug policies in other regions?

This study explores these issues by reviewing findings from previous literature on situations and challenges in drug abuse, as well as policies adopted in practice. We focus on neighboring regions of Hong Kong, including mainland China, Taiwan, Korea, as well developed regions including United States and United Kingdom. We do not provide a full systematic review, but cover important evidence to help inform policymaking and restrain

drug abuse in Hong Kong. In particular, we investigate groups at-risk and the changes in response to an ageing population.

2. Method

We search for keywords from the literature during 2000-2018. The keywords include drug use/abuse, substance use/abuse, together with the name of each region. Snowball searching strategy is adopted to explore the references of each paper. We also collect public reports from online sources to track the most recent changes in drug abuse. Historical and current situation in drug abuse is reviewed for each region, followed by discussions on the policy and regulatory efforts, which could benefit the design and implementation of policy instruments in Hong Kong. Studies with repetitive information were excluded from this study.

3. Results

According to the World Drug Report by United Nations Office on Drugs and Crime[9], the annual prevalence of opiates use was 0.25% (i.e., 25 per 10,000 people) in mainland China in 2005, higher than 0.20% in Hong Kong and Taiwan. The overall rates in these places were all declining in recent years. In contrast, United States has much higher drug abuse rates, which were increasing from 0.73% in 2010 to 1.04% in 2016. This plausibly reflects socioeconomic differences such as cultures and relevant policies on drug abuse across regions. We elaborate the details in the following sections.

[9] https://dataunodc.un.org/drugs/prevalence_table-2017.

3.1 Hong Kong

The trends in drug abuse in Hong Kong was discussed extensively in the previous two papers (Liu and Gietel-Basten, 2019 a & b). We further provide details on the situation and policies. According to the Central Registry of Drug Abuse 67th Report , ketamine was the most commonly abused psychotropic substance during the period between 2008 and 2014, but methamphetamine surpassed ketamine to become the most popular psychotropic substance abused since 2015. The number of reported abusers taking ketamine, MDMA, cough medicine, methamphetamine, cannabis, nimetazepam and triazolam/midazolam/zopiclone observed a decline in 2017. Sassano-Higgins et al. (2016) reviewed the history and effects of ketamine abuse. Originally developed as a safer alternative to phencyclidine in the 1960s, ketamine is primarily used in clinical settings for analgesia and sedation, but is also used for pain management and treatment of asthma and depression in recent years. Clinical use of ketamine causes dissociation and emergence delirium, which have led to recreational abuse. Although death from direct pharmacologic effects appears rare, the disinhibition and altered sensory perceptions caused by ketamine puts users at risk of environmental harm, and chronic ketamine use may lead to morbidity.

In terms of anti-drug policy, the Narcotics Division (ND) of Hong Kong conducts regular surveys of drug use among students of upper primary, secondary and post-secondary education programs. The Social Welfare Department collaborates with Non-Governmental Organizations (NGO) by subventing them to deliver drug prevention and rehabilitation programs through a holistic approach (Ng, 2005). Furthermore, new technologies have been introduced to detect conventional and novel drugs in clinical practice (Tsui et al., 2011).

The exploration of the determinants of drug abuse would benefit anti-drug policy design. In particular, the literature shows that self-esteem and social pressure seem to play an important role in drug use decision in Hong Kong. For example, Wu et al. (2014) conducted a survey on multidimensional self-esteem and substance use behaviors among the adolescents in Hong Kong. They found that peer and school self-esteem positively correlate with drug use among males, while body image self-esteem predicts alcohol use among females. Hence, education could play an important role in discouraging drug use by enhancing self-esteem of the youth. Laidler et al. (2004) showed that young people's drug use is not solely confined to the dance scene, and it is linked to social pressure placing high expectations on educational attainment while offering limited opportunities for personal development and employment. This situation is quite unique in Hong Kong. Cheung et al. (2003) conducted a three-year longitudinal study and used the path analysis method to examine the demographic, social, psychological, and treatment factors associated with chronic drug use in Hong Kong. The findings support previous research on the importance of self-efficacy and the association with drug-free friends and support from non-drug-using friends, in affecting the performance of chronic drug addicts. Parents' divorce, separation or passing away has a high influence on substance abuse among adolescents. Feeling happy about family life, good relationship with parents and acceptance to parenting are significant protective factors to substance abuse (Legislative Council, 2011).

3.2 Mainland China

Drug abuse is a historical and modern issue in mainland China. The number of drug abusers has been increasing at an alarming rate in recent years. For example, the number of registered drug addicts increased from 70,000 in 1990 to one million in 2002 (Zhao et

al., 2004). Relatedly, the prevalence of HIV/AIDS and drug crimes has been emerging in China. Around 540,000 to 760,000 people were infected with HIV in China in 2005 (MoH and UNAIDS., 2006). Heroin injection played a predominant role in fueling China's AIDS epidemic. Lu et al. (2007) reviewed the history of drug abuse in China and suggested that the epidemic of drug use and HIV is likely related with the open-policy of China in the 1980s. Chu and Levy (2005) showed that the first outbreak of HIV in China was reported in the border area of Yunnan province between China and Myanmar where drug trafficking is heavy, and has spread to all Chinese regions later. Fang et al. (2006) revealed that illicit drug production and trafficking have swept most of southern China. The trafficking routes of Golden Triangle lead out of Myanmar into Yunnan, and then go east to Nanning and Guangzhou or Hong Kong, or north to Urumchi through Sichuan. About 60% of drugs produced in the Golden Triangle, such as heroin, opium, and crystal methamphetamine, are reported to be trafficked through China. Opioids are the most common drugs used in mainland China, while abuse of "new" drugs including amphetamines, MDMA (Ecstasy) and ketamine have soared since 1997 (Zhao et al., 2004). MDMA, methamphetamine and ketamine account for 5.6% of drugs used by new drug abusers, second only to opiates (Fang et al., 2006). Most drug abusers in China tend to be young, less educated, unmarried, and without a stable occupation (Chun and Levy, 2005).

Drug abuse has caused severe problems for both the abusers and society in China. In light of the adverse social impacts, the main policy target is to control the spread of HIV/AIDS diseases and other adverse consequences such as mental health and family issues. Zhao et al. (2006) mentioned three types of treatment settings in China: compulsory detoxification institutions run by the public security section, rehabilitation

units through labor run by departments of justice, and detoxification institutions run by departments of health. Pharmaceutical therapy and traditional Chinese medicine (TCM) are utilized for drug addiction. On the one hand, methadone-based withdrawal regimens have been performed in China since 1993. Medical treatments are often combined with psychological counseling and physical training. Patients will stay in a compulsory detoxification setting for 3–6 months or 1 year, and stay in camps for 1–3 years. For voluntary detoxification, patients usually stay in treatment for 7–30 days. On the other hand, TCM and acupuncture are more commonly adopted for discouraging drug use in China than in other regions. TCM may be effective, but the use is controversial out of China. For severe symptoms, the effect of TCM is not good at the beginning of treatment. Overall, the efficacy of TCM in controlling opiate withdrawal symptoms has been found to be less than narcotic detoxification agents, but similar to or better than non-narcotic detoxification agents (Fang et al. 2006). Therefore, many settings use TCM together with methadone or buprenorphine, and use TCM during the rehabilitation period to prevent relapse. Despite the regulatory efforts and high risks of drug use in China, drug abuse remains a challenging issue and public threat. Although opiate abuse and its associated harm have been controlled effectively in some areas, the synthetic drugs and new designer drugs have complicated the drug abuse situation. The circumstance requires the government to implement strong, effective, and immediate intervention.

In addition to the typical determinants, some new factors of drug abuse are highlighted in mainland China but not in Hong Kong. Sun et al. (2014) reviewed the recent situation in drug abuse in China, suggesting that Internet and telephone further facilitate drug trafficking, and poly-drug use is becoming common. The majority of frequent Internet users are the young people. For example, among these internet users,

more than half (53.8%) are people who are 25 years of age or younger. Gong et al. (2009) highlighted the role of Internet by using structural equation models (SEM) based on surveys on Internet use and drug use behaviors among the adolescents in schools in Wuhan City, China. The positive relationship between drug use and Internet use is mediated by the attitudes towards drug use and relevant social norms. In addition, several research underscored the importance of taking into account the role of stigmatization in determining drug use. For instance, although minority nationalities represent 8.1% of China's total population, they account for more than 30% of the reported HIV/AIDS cases. Deng et al. (2007) conducted a survey on stigma and discrimination against drug abusers and people living with HIV/AIDS in a Dai minority nationality community in Yunnan Province of China. The data revealed entrenched stigma and overt discrimination against drug abusers that manifested in familial, work, civil and institutional contexts. The study pointed out that stigma created a vicious cycle of social isolation, marginalization and thus addiction relapse. This in turn reinforced the stigmatization and discrimination against drug abusers and thus hindered efforts towards prevention and control of HIV/AIDS. The findings are important for policies against drug use, but have been missed by most concurrent policies. Intervention programs that were insensitive to the local culture and religion may have also contributed partially to the stigmatization of drug abusers.

3.3 Taiwan, South Korea and Japan

The drug abuse situation in other East-Asian regions, particularly Taiwan, are similar to that in Hong Kong. Geographical and cultural proximity may play a key role. For instance, Lee et al. (2013) surveyed the laboratory analytical data of urine and non-urine cases and estimated the illicit drug use trends in Taiwan during 1999–2011. The results showed that

methamphetamine was the most widely used drug, but the distribution rates of ketamine in urine and non-urine samples have been climbing since 2000 in Taiwan. This situation is very similar to Hong Kong. Club drugs, such as MDMA and ketamine, are the most widely used drugs at night clubs and dance parties to enhance social intimacy and sensory stimulation. Ketamine is typically taken with MDMA, which can produce hallucinations and out-of- body subjective experiences similar to near-death experiences.

Feng et al. (2016) compared the drug use pattern between Taiwan and South Korea from 2006 to 2014. In Taiwan, the major illicit drugs are methamphetamine, heroin, and ketamine, whereas in South Korea those are methamphetamine and cannabis. The illicit drug use situation in Taiwan was at a higher stake than that in South Korea according to illicit drug seizures per capita. Similar to Hong Kong, ketamine has been a major drug in Taiwan, but it was seldom found in South Korea. Besides ketamine, synthetic cathinones is a major drug in Taiwan, whereas synthetic cannabinoids and phenethylamines are popular in South Korea. Although the controlled items in Taiwan (23) were less than those in South Korea (93), the quantity of total seizures was much larger in Taiwan than in South Korea. The current statuses of illicit drug use in Taiwan and South Korea can be explained by drug policy, availability and accessibility.

Tang et al. (2007) conducted a contingent valuation using telephone survey to measure the willingness to pay (WTP) for drug abuse treatment in Taiwan. They found that the general public in Taiwan was willing to pay NT$81.00-95.00 (around USD 2.5-3.0 as of 2004) per month for drug abuse treatment, while the benefits of drug abuse treatment were NT$12.8-15.0 billion in 2004, which was around 0.15% of Taiwan's GDP. Preferences for the drug abuse treatment program were sensitive to the target population as well as the sequence in which the WTP questions were asked.

Chung et al. (2004) mentioned that drug abuse became a social problem in South Korea since the early 1980s, and drug abuse and drug trafficking have been increasing. From the mid-1980s, there was a sharp increase in trafficking and abuse of methamphetamine, and a large number of abusers were arrested in 1988. Since then, the number of abusers had been declining until 1993. The number of drug offenders has then increased from 5418 in 1995 to 10,304 in 2000. Methamphetamine is the most abused drug followed by cannabis and opiates. Seizure records of new drugs such as MDMA and LSD are increasing, indicating diversification of smuggled drugs. In addition, there is a growing tendency for the abuse of common medicines among young people, as these medicines are easily available in South Korea.

Wada (2011) reviewed the three historical epidemics of drug abuse in Japan since 1945, with recent spikes in 1997 and 2000. It is becoming easier for drug abusers to hide their tracks by using new drugs that do not produce a psychotic state as easily as traditional drugs, such as ecstasy and Ritalin, while solvent abuse declined and methamphetamine abuse is stabilized. The story of drug abuse in Japan is quite different from former Asian regions, and it highlighted the role of informal social control rather than strict regulation and enforcement. Vaughn et al. (1995) reviewed the history of drug abuse in Japan. One of the hallmarks of Japanese society is its reliance on informal social control and dispute resolution to monitor social interactions (Westermann and Burfeind 1991). The authors claimed that it would be a mistake for Japan to abandon its historical methods of social control to embrace fully an American-style war on drugs. On a more pragmatic level, no connection appears to exist between reduction in drug use and the punitiveness of official responses to drug problems. Thus, Japan would be well advised to revive programs based on citizen volunteer groups and neighborhood associations,

which tap the creative abilities of families, schools, and work environments. These informal methods of social control hold the keys to deterrence and reintegrative shaming, which should help to reduce drug abuse in Japan. In the case of drug offenders, the Japanese tend to rely more heavily on formal systems of control, which has contributed to suppressing the spread of illicit drugs (Furuta 1990; Yokoyama 1992).

3.4 North America and United Kingdom

In the United States, the opioid epidemic or opioid crisis refers to the rapid increase in the use of prescription and nonprescription opioid drugs beginning in the late 1990s. Initiation rates have been very low for cocaine use since the late 1980s and fairly modest for heroin over the same period. In 2016, over 64,000 people in the U.S. died of a drug overdose, with two-thirds of overdoses involving opioids (Packham 2019). Schulden et al. (2009) explored the recent trends in drug abuse in the United States, and observed continued shifts in trends in illicit drug use and called attention to rising rates of prescription drug misuse and abuse. Hall et al. (2008) showed a marked increase in the misuse of prescription opioid medications, such as oxycodone and hydrocodone, along with a substantial increase in problems associated with such use, including fatal and nonfatal opioid overdose.

The drug strategy in the U.S. is characterized by its emphasis on "community based" strategies. In 2010, the strategy was moving towards a direction to require agencies to collaborate and deliver evidence-based programs that address common risk factors that cause a range of youth problems across different segment of the communities. Boyum and Reuter (2005) showed that American drug policy has emphasized efforts to limit the supply of drugs through vigorous source-country intervention and domestic law enforcement rather than focusing on reducing demand among chronic abusers. The

effectiveness of this strategy has been doubted since drugs have become substantially cheaper. In addition, there is little evidence justifying existing programs to prevent childhood and adolescent drug use. By contrast, treatment programs, despite high dropout rates and difficulty in retaining good staff, have shown both effectiveness and cost-effectiveness, as measured by reductions in crime and illness associated with their clients. But treatment programs, particularly those focused on criminally active heavy users, receive only modest funds.

Quantitative evaluations of policies were mostly conducted in the U.S., which can offer reference for other regions. For instance, Packham (2019) investigated the effects of recent expansion in syringe exchange programs (SEPs) on HIV diagnoses and drug-related overdoses in the wake of the opioid crisis in the United States. The study found that SEP openings decrease HIV diagnoses by up to 18.2 percent. However, SEPs increase rates of opioid-related mortality and hospitalizations, suggesting that needle exchanges alone may be less effective than other interventions at stimulating recovery. Dobkin and Puller (2007) found evidence that certain sub-populations on government cash aid significantly increase their consumption of drugs when their checks arrive at the beginning of the month, and as a result, experience adverse events including hospitalization and death. These findings suggest that "full wallets" adversely affect some aid recipients, and that policymakers should explore alternate disbursement regimes such as a staggered disbursement schedule or in-kind support that have the potential to reduce the rate of adverse events. O'Donnell et al. (1995) showed that a six-year school-based prevention program which modified classroom teacher practices, offered parent training and provided child social skills training, has lowered the rates of drug abuse initiation for

the girls in low-income families, while the boys exhibited increased social and school work skills. This is likely due to enhanced school commitment and class participation.

Despite the extensive literature, little consensus exists regarding the relationship between socioeconomic status and drug abuse. The majority of studies with each of these behaviors documented no significant association between socioeconomic status and adolescents' engagement in these forms of substance use, indicating that family economic and social factors may not exert the same effects between the ages of 10 and 21 as they do in adulthood (Hansen and Chen, 2007). Most of these studies are cross-sectional, suffering from statistical biases in estimates. Patrick et al. (2012) examined the associations of three indicators of family socioeconomic status during childhood—income, wealth, and parental education—with smoking, alcohol use, and marijuana use during young adulthood. They found that alcohol use and marijuana use in young adulthood were associated with higher childhood family socioeconomic status, even after controlling for covariates. Smoking in young adulthood was associated with lower childhood family SES, although the association was explained by demographic and social role covariates. Hanson and Chen (2007) found that low socioeconomic status was associated with poorer diets, less physical activity, and greater cigarette smoking. In addition, there was no clear pattern of associations between socioeconomic status and alcohol consumption or marijuana use. The findings suggest that peer effect may be more important for drug use decision of the young people. Long et al. (2013) examined income and drug use patterns and health risks in Vancouver, Canada. Using generalized linear mixed-effects regression, they found that higher income was strongly associated with higher monthly expenditure on drugs. Higher monthly income was linked to high-risk income generation strategies and markers of high intensity drug use in a dose-dependent

pattern. Additionally, the level of income was negatively associated with enrollment in addiction treatment.

A few studies call for attention to the ageing and drug use issue. Despite a wealth of information on the epidemiology and treatment of alcohol abuse in older adults, few comparable data are available on drug abuse in this population. Little is known about problematic drug use among older people, either because few older drug users exist or because they represent a hidden population. Drug choices can change over time as people get older. For instance, elderly people may not abuse drugs, but may misuse drugs to relieve physical pain or mental issues. Boddiger (2008) discussed studies that have shown increases over the past decade in the number of older adults seeking treatment for marijuana, cocaine, heroin, and other drugs. Additionally, those with the highest reported rates of drug use in their youth and the highest lifetime rates are still in their forties. The changing demographics in drug abuse patterns have also created a need for new treatment and prevention strategies that target ageing adults, forcing many addiction specialists and primary physicians into uncharted territory. Simoni-Wastila and Yang (2006) provided a comprehensive review of literature on the prevalence, risks and protective factors, and screening and diagnosis of drug abuse among the elderly between 1990 and 2006. They found that misuse and abuse of legal and illegal drugs constitute a growing problem among older adults. Psychoactive medications with abuse potential are used by at least 1 in 4 older adults, and such use is likely to grow as the population ages. Nonmedical use of prescription drugs among all adults aged above 50 will increase to 2.7 million by the year 2020. Factors associated with drug abuse in older adults include female sex, social isolation, history of a substance-use or mental health disorder, and medical exposure to prescription drugs with abuse potential. Special approaches may be necessary when

treating substance-use disorders in older adults with multiple comorbidities and/or functional impairment. The treatment of disorders of prescription drug use in older adults may involve family and caretakers, and should take into account the unique physical, emotional, and cognitive factors of ageing. Further research is needed on the epidemiologic, health services, and treatment aspects of drug abuse in older adults, as well as the development of appropriate screening and diagnostic tools.

Anderson and Levy (2005) conducted 40 in-depth interviews of drug abusers in U.S. As they aged they switched drugs and modes of operating on the street to accommodate the biological and psychosocial changes that negated their ability to maintain their former drug using careers. Nostalgic for the 'Old School' mores of the past, and unable to transcend or assimilate fully into the cultural practices and norms of the 'New', they respond to their predicament by embracing 'poise' in the face of loneliness, stress and fear of victimization. Such a change in how older injectors maintain their drug use in late adulthood calls attention to how age, period and cohort effects can intersect.

Beynon (2009) stated that use of illicit drugs by people aged 50 and over is increasing in not only U.S. but also Europe. European estimates suggest the number of people aged 65 and over with substance abuse problems or requiring treatment for substance abuse disorders will more than double between 2001 and 2020. This increase largely reflects the ageing of general populations, and people who use drugs continuing to do so as they age. The life expectancy of these drug users has increased due to better treatment harm minimization initiatives. The natural progression of certain diseases means that symptoms only manifest in older age and the lives of older drug users are likely to be characterized by considerable levels of morbidity. Concurrent ageing and the

use of illicit drugs present unique problems for older people, particularly in terms of the chronic effects of drug use on ageing brains and bodies.

As a former colony, Hong Kong shares many aspects in common with United Kingdom, such as institutions, culture, etc. There is a review comparing drug policies at country level with a focus on family relationship (Legislative Council, 2011). For instance, in United Kingdom, the ten-year drug strategy (2008 – 2018) prioritizes families for the first time (Department for Children, Schools and Families, 2008). Beynon et al. (2010) showed that both historically and currently, UK policies on illegal drug use have been largely focused towards younger people, but there is growing evidence of a shift in the demographic profile of people who use illegal drugs, with an increasing substantial number of drug users aged over 40 years. Some people recommence or escalate drug use in later life, so general practice should be vigilant to the possibility of drug use across a person's life course. In those who are identified, appropriate harm reduction advice is necessary so that older people understand the interactions between drug use and ageing. Evidence showing that older drug users have little or no family support suggests that social care in addition to health services will be necessary. Beynon et al. (2007) found that the average age of drug users in contact with treatment services and agency-based syringe exchange programs (SEPs) in the counties of Cheshire and Merseyside in northwest England was rising from 1992 to 2004. Drug use amongst older people is associated with poor physical and psychological health and longer hospital stays. The future cost of the ageing of drug users may be considerable.

4. Discussion and Conclusion

The previous sections discussed the drug abuse situation and policy by region. What can be learnt from the similarities and differences for Hong Kong and other regions? One

commonality among the regions is the growing prevalence of psychotropic drugs such as ketamine in Chinese culture, including mainland China, Hong Kong and Taiwan. In comparison, ketamine is not as popular in South Korea, United States and Europe. This may be related with regional variations and trends, such as increase in ketamine production in Golden Triangle, as well as cultural differences. Interestingly, a growing prevalence of drug abuse among the elderly is also observed in many of these regions. However, as aforementioned, although the number of elderly abusers are increasing in recent Hong Kong, the rate of drug abuse is actually stable or decreasing. Importantly, we highlight that ageing is a growing concern affecting middle-aged abuse of drugs in Hong Kong. This reflects that population ageing is more rapid in Hong Kong than in other regions such as United States.

Another similarity across regions is the problem of hidden drug use, which is common in all regions and studies. In particular, given the large population in mainland China, the accurate reporting of drug abuse may be more challenging than other regions. For example, the number of drug addicts soared, but this may be partially related with under-reporting which is becoming less severe than before. Or, the actual situation may be worse that the number has revealed if hidden drug use is becoming more common. However, there is no accurate way of measuring the under-reporting in each region for comparison. We previously quote from official resources suggesting the under-reporting ratio is less than 10% in Hong Kong.

The differences in anti-drug policies across regions are the adoption of traditional Chinese medicine and styles of rehabilitation and treatment programs. For instance, according to China's law, all drug abusers are forced to detoxify whenever drugs are detected, and if they relapse after detoxification, they will be sent to rehabilitate in camps

through labor. While in other regions, rehabilitation is not as strictly enforced as mainland China. Only criminals who were found to have strong drug reliance and are suitable for compulsory programs would be sentenced to stay in Drug Addiction Treatment Centre in Hong Kong. Japan relies on informal social controls, which could be encouraged in Hong Kong with considerate design.

In light of the above, drug policies take care of differences in culture and drug use patterns. Hong Kong is unique in many ways, thus shall be careful in adopting drug policies following other regions. For instance, the high housing prices of small apartments can complicate the relationship between drug use and other factors. As people are under long-term pressure, policies shall pay more attention to improve the subjective well-being by either providing monetary reliefs, community support or guidance to restrain drug abuse or misuse. For instance, some pre-existing polies may be piloted in small areas in Hong Kong, such as caring for the elderly and middle-aged females. Furthermore, income may not be determinant of drug abuse of youth, whereas education is proved to be effective in averting drug initiation at an early stage among the youth. In particular, education shall be enhanced among young Internet users in Hong Kong. Limiting access to Internet and additional protection at young ages may help relieve this Internet concern. More research can be done on Internet and drug use in Hong Kong in the future. In addition, rehabilitation program tackling drug demand may be effective to supplement enforcement against drug supply as suggested by the experience in United States. Lastly, traditional Chinese medicine may be considered together with other treatments based on practices in mainland China.

Challenges remain in identifying determinants of drug abuse in Hong Kong and other regions. For instance, income and drug abuse can be positively correlated, but the

evidence is mixed. Quantitative studies on causally estimating the determinants of drug abuse and policy evaluations are limited in Hong Kong and other Asian areas compared with United States. Future research on drug abuse shall focus on novel methods and data to further unravel the relationships between individual vulnerabilities for drugs and social risk factors.

Chapter 4. Concluding Remarks

Human capital is critical for sustainable development in a complex world with rapid changes and emerging challenges. Drug use adversely affects human capital by bringing physical pain along with mental disorder, hurting family relations, and inducing violence and crimes. Despite long-term endeavors in dampening drug abuse from both the supply and demand sides, drug abuse remains prevalent in many developing and developed countries. New data and methods are continuously needed to unravel the situation of drug abuse in the population as well as the drivers and determinants behind the changes and trends, which is required for policy response in a timely and effective manner.

This study introduces the demography of drug abuse measured by rates of drug abuse for sub-populations categorized by gender, age, education, income and so on. On top of it, socioeconomic and demographic determinants of drug abuse are explored quantitatively using statistical approaches. A further review on drug use situation and policy practices across different parts of the world highlights the significance of evidence from Hong Kong and can facilitate both local and regional policymaking. In general, we find that due to the rapid ageing, the numbers of drug abusers are growing for the older people in Hong Kong, but the severity measured by drug abuse rate is increasing for the middle-aged groups and specific young generations. New types of drugs with lower prices and damages (thus are harder to detect than traditional ones) make it more challenging to understand the variations and mechanisms behind drug use. As the social pressure remains high with enlarging socioeconomic disparities in Hong Kong, local policies shall pay more attention to catering various needs of different sub-populations and advocate the collection of evidence on both drug use determinants and relevant policy evaluation. We recommend the government and other stakeholders to take into account the

demography of drug abuse to consistently measure and compare drug abuse, and consider incentive-based policies to curb drug abuse in Hong Kong. This study reveals only a small portion of the drug abuse issue in Hong Kong from the demand side. In recognition of the limitation, more efforts are needed to understand and cope with drug abuse in the future.

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