Using Population Based Data on Drugs Abuse to Estimate the Relative Need for Medical Services in Thailand

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Background and Objective: *Epidemiological background shows a trend in drug abuse and essential need for revising its strategic plans, allocating resources, and advocating services for populations. The relative need for drug abuse prevention and medical services across different geographic areas of Thailand, which has been examined through an analysis of existing population-based datasets and reported routinely. The objective was to develop an indicator of relative need for drug abuse prevention and medical services.*

Material and Method: *Qualitative data were collected as primary data sources from 10 focus group discussions throughout Thailand. The primary data were integrated into study framework with the result from literature review. Data sets in 2011 were retrieved from the national databank to obtain variables regarding drug abuse. Multiple regression and factor analysis were undertaken using the district as the unit of analysis.*

Results: *A factor analysis, which revealed six factors that explained 64% of the variance in the data set. Factors identified in the analysis were taken as indicators of variation in the need for services as all of the drugs-related variables loaded strongly on these factors. The distribution of ranks for factor scores (determined through regression) obtained for these factors across districts in Thailand showed that scores were highest in urban and suburban areas.*

Conclusion: *In terms of practical implications, the study results could be used for resource allocation in medical service plans for community drug abuse.*

Keywords: *Drug abuse, Service, Estimation, Population-based data*

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Drug abuse is a major global health challenge, with an estimated 183,000 (range: 95,000-226,000) drug-related deaths reported in 2012[1]. United Nations Office on Drugs and Crime (UNODC) reported 162-324 million people had used an illicit drug at least once in the previous year. Thailand has been burdened with the supply of and demand for many types of illicit substances. The common indigenous natural products are cannabis and opium. The first heroin epidemic emerged abruptly following the resumption of legal control of the opium franchise in 1960[2]. Amphetamines Type Stimulants, synthetic drugs, evolved into a major epidemic in the early 1990s[2]. The sniffing of volatile substances, benzene, lacquer and glue first appeared in the late1970s. In late the 1990's, the abuse of a new set of substances, ecstasy, ketamine, crystalline methamphetamine, cocaine and hashish emerged. Finally, during recent years the abuse of prescription drugs and, in particular, cough mixtures, has become evident[3]. At present, the number of drug users who have access to any kind of treatment is 406,119 persons in 2014[4]. This figure corresponds to a morbidity rate of 8.9 per one thousand among the population aged 15-64. However, it is believed that numerous drug users remain disguised in the general population.

In general, people begin taking drugs for a variety of reasons: to produce intense feelings of pleasure; to relief suffering from social anxiety, stress-related disorders, and depression; to treat illness, physical attractiveness; to improve their athletic or cognitive performance; and to be curious with or without peer pressure. These can similarly play a role in initial experimentation and continued drug use. The overall risk of addiction is impacted by the biological makeup of the individual. Although taking drugs at any age can lead to addiction, research shows that the earlier a person begins to use drugs the more likely

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they are to progress to more serious abuse[5-9]. Moreover, it can even be influenced by gender[9-11] or ethnicity[6,9,11], and the surrounding social environment (school, and neighborhood)[12,13]. Individuals with mental disorders are at greater risk of drug abuse and addiction than the general population[6,7,9,10,14,15]. Parents or older family members who abuse alcohol or drugs, or who engage in criminal behavior, can increase children's risks of developing their own drug problems[7-10,15]. In addition, methods of administration, in particular, smoking a drug or injecting it into a vein increases its addictive potential[16,17]. These factors influence consumption, reflecting drugs demand in endemic areas.

However, drug abuse situation is dynamic depending on many factors from drugs demand, supply, and environment. In response to the drug abuse epidemic, Division of Epidemiology, Services and Prevention Research of National Institute on Drug Abuse (NIDA) has supported the Community Epidemiology Work Group (CEWG) in the United States of America since 1976. The network of researchers monitor and assess drug abuse patterns, trends, and emerging problems across 21 sentinel areas in the United States using multiple sources of data such as the substance abuse and mental health services administration, drug abuse warning network, drug enforcement administration, the arrestee drug abuse monitoring programs, the youth risk behavior survey etc. CEWG access multiple sources of existing data from their local areas to report on drug abuse patterns and consequences in their areas and to provide an alert regarding potential emerging new issues. This descriptive and analytic information is used to inform the health and scientific communities and the general public about the current nature and patterns of drug abuse, emerging trends, and consequences of drug abuse. Representatives meet semi-annually to provide ongoing community-level public health surveillance of drug abuse through presentation and discussion of quantitative and qualitative data[18]. In August 2014, CEWG was transformed to the National Drug Early Warning System (NDEWS). NDEWS continues to monitor drug trends in many of the same sentinel sites as the CEWG using many of the national and local data sources that have been utilized. NDEWS is expected to report on drug abuse trends and emerging issues.

The World Health Organization has been providing technical assistance in the systematic collection of information and meaningful utilization of data in prevention and treatment programs[19-22]. These publications reviewed drug epidemiology methods in general and the usage of these methods in some specific populations. The United Nations International Drug Control Program collected data from many countries on drug usage trends and trafficking as well as on drug-related deaths, treatment programs and social and economic costs[23]. Reports are made by individual countries where existing data are addressed. However, annual reports are published two years later.

In response to the drug abuse problems in Thailand, the government has declared substance abuse problem to become a national agenda since 2001[24]. Government ministers are looking for effective policy interventions with existing resources. It is crucial to perform epidemiological forecast and the affected population are essential for designing effective policy interventions. In particular, the responses at a national level regarding drug abuse can be strengthened by improved advance information on epidemiological situation. By forecasting epidemiological trends, a country can revise its strategic plans, allocate resources appropriately, improve the modeling of its epidemic and advocate services for those populations in endemic areas. This study documented the change in district-based drug abuse situations during 2011 and examined the influences of covariates on situation in endemic area.

Material and Method

Procedures

With 90 persons, qualitative data were collected as primary data sources from 10 focus group discussions throughout Thailand. Of these, 77 persons were responsible for drug abuse surveillance data at provincial level and participated in nine focus group discussions. Another group composed of 10 persons responsible for drugs abuse surveillance system at regional level and three persons responsible at national level. The primary data were integrated into study framework with the result from literature review.

Office of the Narcotic Control Board (ONCB) of Thailand currently handled various national data banks reported regularly from related agencies. Data in this study included the, national treatment system, trafficking system and drug seizures all retrieved from national data system of 2011.

Unit of geographic analysis

The unit of analysis chosen was district level. The unit is the smallest geographical unit at which most available drugs abuse indicators are reliable. Moreover,

it represents a widely understood unit of analysis that corresponds in terms of defining a local community. District unit also plays an important role in operating narcotics control measures. This is also the level at which local community initiatives often operate. For these reasons, the district was selected as the preferred unit upon which to base geographic analyses of drugs abuse at the local level. Nine hundred fifty districts throughout Thailand were included in the analysis presented in this paper.

Indicator data

A variety of drugs abuse related data sets were obtained for the purposes of developing an indicator of relative need. According to the literature review, data lists regarding drugs abuse were needed for this analysis. However, only 61 variables at district-based levels could be comparable for the past 10 years. Thus, datasets that were reported in 2011 (only 61 variables) that could be aggregated to district boundaries were included in the analyses. These criteria meant that it was not possible to include some important datasets in the analysis. The datasets included were data on treatment, trafficking, and district's environment.

Data extraction and refinement

All drug-related data were obtained for in 2011. Population data for each district modeled from the Office of the Central Registrar, Department of Provincial Administration, were obtained for the 2011 calendar year.

Although estimations of drug users were carried out periodically in Thailand through national household survey, drug abusers estimated data were taken directly from the recently national household survey in 2011. Sub-regional figures were used as proxies for individual districts.

Treatment data

In Thailand, drug abusers are illegal. There are three treatment systems for drug abusers: voluntary system, compulsory system, and correctional system. Drug abusers who access to any of these systems will be asked to provide personal data regarding drug abuse and others necessary information. Treatment unit asks to enter the data to the national system as a standard procedure. Thus, drug abuser dataset is pooled into the national data bank. Drug abusers data obtained from national data bank were; current users by gender, occupation, drug type, route of administration, treatment system access, relapse, incidence by gender, age of onset, age at first treatment, age at latest treatment, and poly drug users. Data retrieved were used to generate number per 10,000 population.

Trafficking data

The smallest geographical unit, at which most available data regarding illicit drugs is located, is the police station. Any criminality case, related data will be entered into police system. Thus, dataset is pooled into the national data bank. Trafficking data obtained from the national data bank were: drug offenders by age, legal charges, type of illicit drug-psychoactive substance, citizenship, and seizure. Data on seizure retrieved were calculated based on legislative penalty. Thus, drug substance seizures were standardized and generated a number per 10,000 population.

Missing data

There have been many theories adopted to account for missing data (e.g. hot deck imputation; mean imputation; regression imputation)[25]. For the purpose of not changing the sample mean for that variable, mean imputation was used for missing data in this study.

Statistics

There are two steps in data analysis: multiple regression and factor analysis.

Drug abusers estimated data from the 2011 national household survey was merged into the retrieved datasets. Multiple Linear Regression Analysis using stepwise method was performed to select potential indicators. Potential indicators were used as conceptual frame to recruited indicators 2011 datasets. Factor Analysis using principal components extraction and varimax rotation were carried out to examine underlying structure in the datasets. Key indicators from each annual dataset, with variance explained 70% and over, will be chosen. Factor scores were extracted from the analysis using the regression approach[26]. Size of the population within district was used to weight the analysis in order to control variation that is merely a function of the size of the population within district. The same indicators from each year were structured inductively to transform into a model estimating the relative need for district-based data on prevention and services regarding drug abuse in Thailand.

Results

Of 61 variables and estimated number of drug

users in 2011 data set, multiple linear regression with stepwise method revealed 19 potential indicators with coefficient of determination of 0.866. The district mean for each of the potential indicators, along with the maximum and minimum value, is shown in Table 1.

The factor analysis revealed six orthogonal factors with an Eigen value greater than 1. As can be seen in Table 2, these six factors explained 63.774% of the total variance observed in the annual data set. The six factors have been given the labels 'method of use and treatment', 'trafficking', 'opium and heroin', 'volatile', 'natural plant offenders', and 'club drug users' according to the variables loading on each factor as detailed in Table 3.

Table 3 shows the factor matrix in terms of the factor loadings for each of the variables in the analysis. Inspection of Table 3 suggests that the six factors represent good summaries of different aspects of the data matrix. The 'method of use and treatment' factor summarizes the variables well with all treatment variables loading strongly on this factor. The variables loading on the second factor, the 'trafficking' factor, are primarily supply and consist of the hashish and precursor variables. The variables loading on the 'opium and heroin' are related to classical narcotics that are re-emerging. The variables loading on the "volatiles" are related to various inhalants. The variables loading on the 'natural plant offenders' are related to *Mitragynaspeciosa* (Kratom). The variables loading on the 'club drugs users' are related to cocaine and ecstasy.

At the district level, these data sets represent a variety of indicators related to drugs abuse epidemiology ranging from mild to severe. Factor scores obtained from these factors represent a composite indicator of the principal drug abuse related variables included in the analysis. Consequently, it is reasonable to assume that the regional pattern of the need for services, as captured by the variables loading on these factors will follow the regional pattern observed for these factor scores as assumed in the epidemiology data system. In this way, scores obtained for these factors can be used to make comparisons about the need for services across the country. Maps show the distribution of quintile rankings for these factor scores for district across Thailand.

Inspection of map suggests considerable variation in the district scores obtained for these factors. Quintile ranks of factor scores were significantly higher in the non-metropolitan areas and lowest in the middle and outer metropolitan areas ($p<0.01$). Indeed, over 50% of the urban and sub-urban districts were ranked in the top two quintiles. These rankings were also high for the inner city and outskirt areas of Bangkok

Table 1. Predictor indicators

Indicators	Mean	Min	Max	*p*-value
Heroin seizure (20 gram)	28.5793	0	9750.36	0.043
Hashish seizure (gram)	0.0076	0	6.31	0.003
Rate of inhalant users in 10,000 population	0.639	0	12.79	0.001
Rate of Kratom offenders in 10,000 population	2.0553	0	92.92	<0.001
Rate of Pseudoephedrine offenders in 10,000 population	0.0019	0	0.37	<0.001
Rate of Opium users in 10,000 population	0.2508	0	38.62	0.047
Rate of Cocaine users in 10,000 population	0.0014	0	0.18	0.001
Rate of Ecstasy users in 10,000 population	0.0028	0	0.46	<0.001
Rate of Volatile users in 10,000 population	0.3474	0	7.06	0.003
Rate of Ketamine users in 10,000 population	0.0012	0	0.09	<0.001
Rate of Domicum users in 10,000 population	0.0021	0	0.55	<0.001
Rate of poly-drug users in 10,000 population	0.4943	0	10.46	<0.001
Rate of drug users on correction system in 10,000 population	1.0785	0	12.39	<0.001
Rate of drug users on voluntary system in 10,000 population	3.0107	0	39.17	0.008
Rate of drug users who are unskilled labour in 10,000 population	0.2536	0	6.88	<0.001
Rate of drug users who intake through smoking in 10,000 population	11.7912	0	76.61	<0.001
Rate of drug users who work in companies in 10,000 population	0.3627	0	15.87	<0.001
Rate of drug users who work in unclassified career in 10,000 population	0.4411	0	9.36	<0.001
Rate of drug users who work related to transportation in 10,000 population	0.0967	0	5.23	0.038
Adjusted R square = 0.866				

Table 2. Orthogonal factors

Component	Initial Eigen values			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	4.858	25.571	25.571	4.858	25.571	25.571	4.019	21.152	21.152
2	1.725	9.079	34.650	1.725	9.079	34.650	1.880	9.896	31.048
3	1.585	8.344	42.994	1.585	8.344	42.994	1.735	9.131	40.180
4	1.483	7.804	50.798	1.483	7.804	50.798	1.672	8.802	48.982
5	1.338	7.044	57.842	1.338	7.044	57.842	1.467	7.724	56.705
6	1.127	5.932	63.774	1.127	5.932	63.774	1.343	7.069	63.774
7	0.972	5.118	68.892						
8	0.893	4.701	73.594						
9	0.804	4.233	77.827						
10	0.758	3.991	81.818						
11	0.625	3.291	85.109						
12	0.528	2.777	87.886						
13	0.469	2.467	90.353						
14	0.452	2.379	92.731						
15	0.365	1.920	94.652						
16	0.311	1.638	96.290						
17	0.304	1.599	97.889						
18	0.228	1.201	99.090						
19	0.173	0.910	100.000						

Table 3. Component matrix

	Component					
	1	2	3	4	5	6
Rate of drug users who intake through smoking in 10,000 population	0.819	-0.008	0.150	0.104	-0.150	-0.048
Rate of drug users on correction system in 10,000 population	0.759	0.036	0.134	-0.020	0.179	-0.113
Rate of drug users who work in companies in 10,000 population	0.727	0.001	-0.245	-0.232	-0.147	0.243
Rate of poly-drug users in 10,000 population	0.712	0.049	-0.081	-0.186	0.425	-0.033
Rate of drug users on voluntary system in 10,000 population	0.705	0.252	0.325	0.036	0.125	-0.070
Rate of drug users who work in unclassified career in 10,000 population	0.651	-0.050	-0.040	-0.139	0.157	0.084
Rate of drug users who are unskilled labor in 10,000 population	0.647	0.078	0.197	-0.130	-0.135	0.129
Rate of drug users who work related to transportation in 10,000 population	0.637	0.008	-0.288	-0.096	-0.212	-0.331
Rate of Domicum users in 10,000 population	0.338	-0.259	-0.115	0.224	-0.220	-0.107
Rate of Cocaine users in 10,000 population	0.334	-0.034	-0.090	-0.312	0.034	0.053
Rate of Pseudoephedrine offenders in 10,000 population	0.211	0.623	-0.478	0.393	0.006	0.033
Hashish seizure (gram)	0.101	0.618	-0.408	0.466	0.020	0.150
Rate of Opium users in 10,000 population	0.172	0.337	0.706	0.109	-0.174	0.059
Heroine seizure (20 gram)	0.091	0.326	0.522	0.223	-0.146	0.033
Rate of Inhalant users in 10,000 population	0.191	-0.537	0.028	0.632	0.198	0.132
Rate of Volatile users in 10,000 population	0.471	-0.516	0.031	0.552	-0.127	0.091
Rate of Kratom offenders in 10,000 population	0.084	-0.009	0.062	0.074	0.857	-0.170
Rate of Ketamine users in 10,000 population	0.327	-0.102	-0.164	-0.016	-0.278	-0.650
Rate of Ecstasy users in 10,000 population	0.375	-0.160	-0.171	-0.215	-0.092	0.629

with the majority of these districts ranked in the top two quintiles for Thailand.

Discussion

An indicator of the relative need for drug abuse services in Thailand has been developed through the analysis of existing data sets collected and compiled at district level in Thailand. There is considerable variation in the district-level indicator values, with much higher rankings evident in the non-metropolitan areas with poorer infrastructure and fewer government services. Rankings were also high for the inner-city areas of Thailand areas traditionally associated with a variety of social problems. To the extent that the indicator adequately captures variation in the extent of drug abuse epidemiological problems, the findings suggest that these areas have a greater need for services and programs.

Previous funding formulae for services in Thailand are largely based upon subjective estimated of district officers. Prior use of such formulae biases funding heavily towards socio-economically deprived areas of the state or those areas with the largest populations the middle and outer suburbs. The data on these factors presented suggest that these kinds of data will not adequately capture the need for services as measured by local area level variation in drug abuse. This is because the variation in drug abuse appears to follow a pattern different from both demand and supply variables included in the present analysis and is clearly weighted towards the more sparsely populated areas of the state.

The indicator presented in this paper represents an important development. The manner in which the indicator is used, however, needs to be explored further. In relation to resource allocation, for example, it is unlikely that the indicator could be used to re-allocate funding previously provided to existing resources. Instead, the indicator would be best used in making decisions regarding the allocation of any future available funding. In this matter, the recent restructuring of services in Thailand has meant that periodic tendering of services is likely to be a component of the service system. The indicator of relative need would be particularly useful in this climate. For example, as funds are freed by virtue of contracts running out, the indicator could be used to decide allocation of these funds across Thailand.

However, the application of the indicators requires consideration of its relationship to other district level variables. In this regard, issues around policies responsiveness need to be considered when making funding decisions. Further, the size of a population in an area needs to be considered, as the actual number of people needing services will be critically dependent on the number of people in an area as well as patterns of use at a district level.

Nevertheless, the advantage of the current approach over previous formulae based on population size used for these purposes is that decisions can be supplemented with data reflecting both the expressed need for certain types of services and the unmet demand for services across regions. The indicator has considerable advantages over other need-based resource allocation procedures, which require questionable assumptions.

The development of this index allows for direct comparison with other data sources. In particular, a large-scale survey on drug abusers prevalence is planned for Thailand in 2016, which should have sufficient statistical power (n>30,000 for the whole country) for the generation of some local level data[27]. The comparison of the results of the present study with the results of this planned survey will allow some degree of external validation of the current results or, alternatively, a consideration of whether population surveys can adequately capture the prevalence of drug abuse.

One of the important potential applications of the findings of the study is in the targeting of primary and secondary prevention activities. Areas of the state with particularly high levels could be identified using the indicator, which could then be used to focus the delivery of community-based education campaigns or general practitioner training programs with a view to minimizing the consequences of drug abuse to these communities for long term.

Conclusion

The indicator presented is an important development. There is clearly considerable scope for further refinement of the indicator. The incorporation of important additional datasets such as drugs-related mortality, Disability Adjusted Life Years (DALYs) will add to the coverage of the indicator. Future work undertaken will include these datasets.

What is already known on this topic?

Regarding the drug abuse situation, there are two methods used currently: registration data and survey data. Registration data on the number of drug abusers treated, number of drug offenders and seizure

are used to compare across countries. In Thailand, captured-recaptured method is used to estimate the number of drug abusers from the past year and multiply to next year situations as well as number of drug offenders and seizures. The total amount was justified into provincial level and distress level, respectively. Survey data are better for estimating. However, they are unable to be done annually due to time and budget constraints. Since 2001, Office of the Narcotics Control Board supports the national household survey 3-5 years a time, which is insufficient to justify services provided annually.

What this study adds?

The roughly estimated using capture-recaptured and justify to provincial level was questioned on its validity. This study used existing datasets, which are reported routinely from various agencies for control measures. Statistical analysis used in this study give a valid figure of existing datasets and survey data. Equations found could be used to forecast epidemiological situations at district levels at low cost.

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Potential conflicts of interest

None.

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การใช้ฐานข้อมูลยาเสพติดเพื่อคาดประมาณการความต้องการบริการทางการแพทย์ของประเทศไทย

พูนรัตน์ ลียติกุล, มานพ คณะโต

ภูมิหลังและวัตถุประสงค์: *แนวโน้มระบาดวิทยาเกี่ยวกับปัญหายาเสพติดเป็นสิ่งจำเป็นเพื่อใช้ในการปรับแผนกลยุทธ์ การจัดสรรทรัพยากรและการสนับสนุนการบริการสำหรับประชาชน ความต้องการในการป้องกันปัญหายาเสพติดและการให้บริการทางการแพทย์มีความแตกต่างกันในแต่ละพื้นที่ประเทศไทยได้มีการตรวจสอบ และวิเคราะห์ข้อมูล Population-based datasets ที่มีอยู่ในการรายงานประจำโดยมีวัตถุประสงค์ในการพัฒนาตัวบ่งชี้ที่สัมพันธ์กับการป้องกัน ปัญหายาเสพติดและความต้องการบริการทางการแพทย์*

วัสดุและวิธีการ: *ข้อมูลปฐมภูมิเป็นข้อมูลเชิงคุณภาพจากการสนทนากลุ่ม 10 กลุ่มทั่วประเทศบูรณา การข้อมูลปฐมภูมิเข้ากับกรอบแนวคิดจากการทบทวนเอกสารวิชาการเรียกใช้ข้อมูลที่เกี่ยวข้องกับยาเสพติดตามกรอบแนวคิดจากฐานข้อมูลยาเสพติดปี พ.ศ. 2554 ซึ่งเป็นฐานข้อมูลระดับประเทศใช้การวิเคราะห์ถดถอยพหุคูณและการวิเคราะห์ปัจจัยโดยมีหน่วยของการวิเคราะห์เป็นรายอำเภอ*

ผลการศึกษา: *ผลการวิเคราะห์รายอำเภอพบว่ามี 6 ปัจจัยซึ่งวัดจากตัวแปรที่ผู้นิพนธ์ศึกษาและที่อธิบายความแปรปรวนได้ร้อยละ 64 ปัจจัยที่พบจากการศึกษา สามารถนำมาใช้เป็นตัวชี้วัดการเปลี่ยนแปลงความต้องการการบริการทางการแพทย์โดยตัวแปรที่เกี่ยวข้องกับยาเสพติดถูกกระจายไปเป็นปัจจัยตามน้ำหนัก factor loading และการจัดอันดับคะแนนปัจจัย (จากการวิเคราะห์ Multiple regression analysis) ได้ปัจจัยที่อธิบายการแปลงเปลี่ยนที่ครอบคลุมทุกอำเภอในประเทศไทยและพบว่ามีคะแนนที่สูงในพื้นที่เมืองและกึ่งเมือง*

สรุป: *ผลการศึกษาเป็นประโยชน์ในการปฏิบัติการจัดสรรทรัพยากรเพื่อการวางแผนบริการทางการแพทย์ที่เกี่ยวกับยาเสพติดในชุมชน*