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Key words: DIS-CM (Chinese modified Diagnostic Interview Schedule); validity; lifetime prevalence.

Chinese diagnostic interview schedule

II. A validity study on estimation of lifetime prevalence

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ABSTRACT - The validity of DIS-CM (Chinese modified version of Diagnostic Interview Schedule) was examined by analyzing lifetime prevalence of each age group, age at onset, and recency of illness. The magnitude of the discrepancy between the empirical and the estimated data was adopted as the criterion of the degree of deviation. Manic and depressive episodes were found to be seriously underestimated. Schizophrenic, panic, phobic and antisocial personality disorders were probably underestimated. The observed lifetime prevalence figures with DIS-CM are rather conservative for these disorders. The prevalence data of a recent 1-year period are less biased and more reliable. The nature of the disease, recall effect, active or passive psychological resistance, mortality, and uncooperative attitude are considered factors that induce an underestimate of lifetime prevalence.

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NIMH-DIS (1) was designed to make 23 diagnostic categories defined in DSM-III (2). It provided symptom questions for the diagnostic criteria required by the DSM-III diagnostic system, such as clinical symptoms, age of onset, chronicity, number of episodes. It also assessed the history of recovery by examining the recency of a specific disorder. DIS-CM was the Chinese translation of NIMH-DIS-II, and some necessary modifications were added. The DIS-CM comprises 25 diagnostic categories and has all the characteristics of NIMH-DIS and been subjected to a series of studies in Taipei (3, 4). It has been shown that DIS-CM is a reasonably good epidemiological tool for case identification in the Chinese population. DIS was designed so that the lifetime prevalence could be assessed, and the data used for calculating the annual first-episode incidence rate. Estimation of whether or not a particular disorder has ever occurred is necessary for calculating both its current prevalence and its first-episode incidence. The ability of DIS to assess lifetime diagnoses is clearly important. As pointed out by Robins et al. (5), the risk of death and the problem of recall might reduce the estimated value of lifetime prevalence by DIS. It is important to use empirical data to investigate how far the deviation is from the expected.

Unless we have knowledge of the degree of underestimation of lifetime prevalence, we can not obtain any sound inference from the lifetime prevalence data reached by DIS interview. This study was designed to analyze the degree of deviation by lifetime prevalence of each current age group, age at onset and recency of the specified disorder.

Theoretically, if a disorder occurs in all age groups, then the lifetime prevalence must increase as age increases. If a disorder occurs only before a certain age group, then lifetime prevalence reaches a plateau after that specific age. As psychiatrically disordered subjects are found to have higher mortality than the general population (6), the older age group may show a

Table 1
Expected age of onset and clinical course of various diagnostic categories

Disorder	Age onset (year)	Clinical course
Depressive	any age	usually episodic
Bipolar	≤ 30	usually episodic
Schizophrenic	≤ 45	usually chronic
Generalized anxiety	any age (less, ≥ 40)	wax and wane (chronic), may remit
Panic	late 10's and 20's or mid-adulthood	episodic, recurrent, or chronic
Phobic	late teens, early 20's, any age	wax and wane (chronic), may remit
Obsessive-Compulsive	10's or 20's	wax and wane (chronic)
Alcohol abuse	late 10's–40's	chronic or remitting
Alcohol dependence	later 10's–40's	chronic, may remit
Drug dependence	late 10's–30's or adulthood	wax and wane, may remit, relapse
Tobacco dependence	late 10's–30's	chronic, may remit
Pathological gambling	10's	wax and wane or chronic
Antisocial personality	< 15	chronic, may remit

decrement of lifetime prevalence. Age at onset could also be examined to see whether the DIS-CM is powerful enough to elicit all theoretical cases in a community as regards lifetime prevalence. If a disorder occurs at all ages, there must be cases from every onset age group in all current age groups. If a disorder occurs only before a certain age, the current age groups under that specific age must have cases from all onset age groups below that specific age.

Apart from this, the recency of a specific disorder can also be used to examine the empirical lifetime prevalence data. If a disorder has an episodic course, then the cases from a community sample must be distributed evenly in all recency categories of the disorder. A disorder with unremitting course will only be in the most recent category, i.e. existing within one recent year. The design of DIS-CM provides the possibility of examining the empirical data of DIS-CM against the theoretical.

Subjects

The Taiwan Psychiatric Epidemiological Project (TPEP), supported by the Health Department of the Executive Yuen of R.O.C., started in 1982. The sampling areas include metropolitan Taipei, and the townships and countryside of Taiwan Province. DIS-CM was adopted as a case-identification tool for TPEP. Data from the metropolitan Taipei sample were used for this study (7).

The DIS-CM provided data concerning 17 diagnostic categories: age at onset and recency of the disorders. As there were too few cases in four of these categories (somatization disorder, drug abuse, transsexualism, and homosexuality), they have not been analyzed. The remaining 13 diagnostic categories were studied to assess the reliability of the estimation of lifetime prevalence. The cases with definite diagnosis reached by by DIS-CM computer diagnostic program were analyzed for lifetime prevalence according to current age groups (18–24, 25–34, 35–44, 45–54, 55–64, ≥ 65), age of onset (≤ 15, 16–24, 25–34, 35–44, 45–54, 55–64, ≥ 65) and recency of the disorder (within 1 year, more than 1 year). The 13 diagnostic categories analyzed comprised depressive episode (44 cases), manic episode (8 cases), schizophrenic disorder (15 cases), generalized anxiety disorder (181 cases), panic disorder (10 cases), phobic disorder (210 cases), obsessive-compulsive disorder (45 cases), alcohol abuse (169 cases), alcohol dependence (73 cases), drug dependence (4 cases), tobacco dependence (387 cases), pathological gambling (24 cases) and antisocial personality disorder (7 cases).

Methods

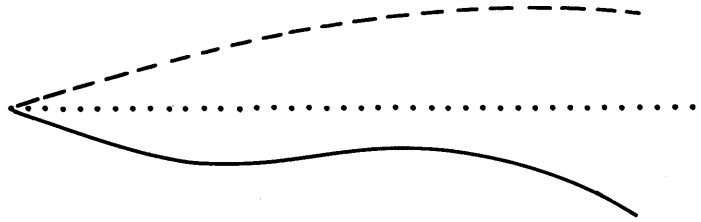
The theoretically expected data on age at onset and clinical course (Table 1) of each disorder were adopted from DSM-III (2) and Psychiatric Diagnosis by Goodwin & Guze (8). The empirical clinical data were obtained from the data file of DIS-CM searched by computer program.

Table 2
Example for the rating of deviation of lifetime prevalence by current age groups (1)

Depressive episode: deviation rating 3

Current age group	18–24	25–34	35–44	45–54	55–64	≥ 65
Prevalence (%)	1.3	0.8	0.6	0.8	0.8	0.5

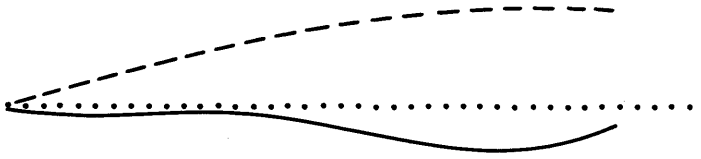
Trend: empirical vs expected



Phobic disorder: deviation rating 2

Current age group	18–24	25–34	35–44	45–54	55–64	≥ 65
Prevalence (%)	5.0	3.7	5.0	3.9	3.4	3.9

Trend: empirical vs expected



* Empirical: ; expected

• • • • • : prevalence of youngest age group as baseline.

Table 2 (2)

Schizophrenic disorder: deviation rating 1

Current age group	18–24	25–34	35–44	45–54	55–64	≥ 65
Prevalence (%)	0.4	0.4	0.2	0.3	0.3	0.0

Trend: empirical vs expected

Tobacco dependence: deviation rating 0

Current age group	18–24	25–34	35–44	45–54	55–64	≥ 65
Prevalence (%)	6.5	6.2	7.4	7.8	11.9	10.3

Trend: empirical vs expected

Table 3
Example of analysis of age of onset against current age group in the case of depressive episode

Age at onset	Current age group					
	I 18–24	II 25–34	III 35–44	IV 45–54	V 55–64	VI ≥ 65
No. cases						
1 ≤ 15	2	1	0	1	0	0
2 16–24	11	4	1	1	0	0
3 25–34		7	3	1	2	1
4 35–44			2	0	1	0
5 45–54				3	2	0
6 55–64					0	1
7 ≥ 65						0
Estimated score (%)	100	100	75	100	67	71
Mean estimated score (%)	$\frac{100+100+75+100+67+71}{6} = 85.5$					

Assessment of deviation in estimation of lifetime prevalence

Lifetime prevalence by current age groups

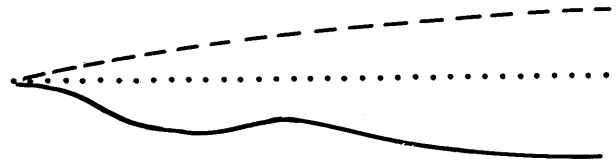
Deviation was rated on a four-point scale (0, 1, 2, 3). Before the assessment was made, the lifetime prevalence of each age group was calculated. The trend of lifetime prevalence of successive age groups was then assessed against the expected trend. If the empirical trend is identical to the expected, then it is rated "0". If the empirical trend runs opposite to the expected, then it is rated "3", standing for severe deviation. Ratings "1" and "2", representing mild and moderate deviation respectively, are judged on the degree of deviation of empirical and expected trends as illustrated in Table 2.

Analysis of age at onset against current age group

The case distribution of depressive episode is shown in Table 3. Six groups of current age and seven ranks of age at onset were formed. Theoretically, depressive episode occurs in every rank of age at onset starting from the first (≤ 15). Thus, each current age group must have cases from all ranks of age at onset below that specified age group. For example, age group IV (45–54) will have cases distributed in five ranks of age at onset, as shown in Table 3. If some of the ranks lower than the specified age group have no case distribution then it is judged, theoretically, to deviate from the expected. This results in an underestimation of lifetime prevalence. In order to offset the possibility of there being no cases in some of the age-at-onset groups in the present sample, the estimated lifetime prevalence score counted in the nominator and discounted the lack of cases in certain groups. Only the age-at-onset groups without cases and farthest from the current age were subtracted from the total ranks for the nominator. The estimation score is then calculated from the formula: [(total of age-of-onset groups minus those ranks without cases and farthest from the current age group) ÷ total number of ranks of age at onset of the specific current age group] × 100%.

As in age group V (55–64) with depressive episode (Table 3), ranks 1 and 2 of age at onset show no cases. The estimated lifetime prevalence score of age group V (discounting the lack of cases in rank 6 (55–65) of age at onset) is 67% (4 ÷ 6 × 100%). In age group IV, discounting the lack of cases in rank 4 (35–44), the age of onset is still counted in the nominator, the estimated score is calculated at 100%. For each disorder, the estimated lifetime-prevalence score is calculated as the mean of scores for all current age groups. As in Table 3, the mean estimated score for depressive episode is calculated as: (100

Table 4
Deviation in estimation of lifetime prevalence by current age group prevalence data (1)

Diagnostic category	Empirical lifetime prevalence (%) against expected trend*						Degree of deviation
	Current age group						
	18–24	25–34	35–44	45–54	55–64	≥ 65	
Depressive episode	1.3	0.8	0.6	0.8	0.8	0.5	
empirical vs expected*							3
Manic episode	0.3	0.1	0.2	0.1	0.0	0.0	
empirical vs expected*							3
Schizophrenic disorder	0.4	0.4	0.2	0.3	0.3	0.0	
empirical vs expected*							1
Generalized anxiety	2.6	3.0	4.8	4.0	4.7	2.8	
empirical vs expected*							0

* See Table 2.

$+100+75+100+67+71) \div 6 = 85.5$. The expected estimated score for all 13 diagnostic categories is 100. The discrepancy between the empirical and expected data (in Table 3 it is 14.5, obtained by substracting 85.5 from 100) is adopted as the indicator for judging whether the deviation of empirical lifetime prevalence from the expected is significant or not. A discrepancy of ≥ 30 is set as serious deviation. For depressive episode (Table 3), the discrepancy is 14.5, and is judged to be not significantly deviated by the analysis of age at onset.

Analysis of recency of each disorder

Theoretically, a disorder having an episodic course must have cases distributed in all varieties of recency as defined in DIS-CM: within 2 weeks, within 1 month, within 6 months, within 1 year, more than 1 year. If a disorder has chronic unremitting course, then all cases must be in the category of "within 2 weeks". Those with episodic course may be evenly distributed in all categories. For convenience of analysis, the categories of recency are condensed into two: within 1 year (≤ 1 year) and more than 1 year (> 1 year).

All cases in each diagnostic category are distributed into both categories of recency of illness. The recency ratio score (RRS) of each disorder is calculated by the following formula: RRS = case number of "> 1 year group"/case number of "≤ 1 year group". The RRS could be adopted as the indicator to assess how good the

Table 4 (2)

Diagnostic category	Empirical lifetime prevalence (%) against expected trend*						Degree of deviation
	Current age group						
	18–24	25–34	35–44	45–54	55–64	≥ 65	
Panic disorder	0.0	0.4	0.2	0.0	0.3	0.0	
empirical vs expected*							1
Phobic disorder	5.0	3.7	5.0	3.9	3.4	3.9	
empirical vs expected*							2
Obsessive compulsive disorder	1.1	0.7	0.4	0.9	1.8	0.8	
empirical vs expected*							0
Alcohol abuse	2.2	3.4	5.0	3.5	3.1	2.8	
empirical vs expected*							1
Alcohol dependence	1.5	1.3	1.2	1.7	1.8	1.3	
empirical vs expected*							0

* See Table 2.

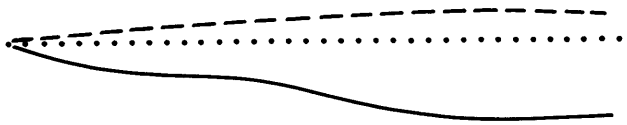
DIS-CM is for estimating the lifetime prevalence of each disorder. If all cases have an episodic course the expected RRS will be greater than 1.0, and if the disorder has an unremitting course the RRS will be 0.0. If some cases (say, 1/3) of a disorder are remitted, but most cases (say, 2/3) are unremitted, then the expected RRS will be 0.5. The discrepancy between the empirical RRS and the expected could be the criterion for judging whether the estimated lifetime prevalence of a disorder deviated significantly or not. The rating of deviation by RRS is defined as follows: "0": discrepancy of empirical and expected RRS ≤ 0.15; "1": discrepancy of RRS 0.16–0.30; "2": discrepancy of RRS ≥ 0.51. Rating 3 is judged as severe deviation and rating 2 is moderate deviation.

After the assessment of deviation of lifetime prevalence by these three indicators, a specific disorder is judged to be seriously deviate when at least two of the three indicators show severe deviation. If moderate degrees of deviation are also to be considered, then a disorder would be judged as being moderately deviate when at least two of the three indicators show either a severe or a moderate degree of deviation.

Results

The degree of deviation in the estimation of lifetime prevalence assessed by analysis of prevalence in each current age group for 13 disorders is shown in Table 4. Depressive and manic epi-

Table 4 (3)

Diagnostic category	Empirical lifetime prevalence (%) against expected trend*						Degree of deviation
	Current age group						
	18–24	25–34	35–44	45–54	55–64	≥ 65	
Drug dependence	0.2	0.08	0.0	0.1	0.0	0.0	
empirical vs expected*							1
Tobacco dependence	6.5	6.2	7.4	7.8	11.9	10.3	
empirical vs expected*							0
Pathological gambling	0.4	0.4	0.8	0.3	0.5	0.5	
empirical vs expected*							0
Antisocial personality disorder	0.4	0.1	0.1	0.0	0.0	0.0	
empirical vs expected*							2

* See Table 2.

Table 5
Deviation in estimation of lifetime prevalence by analyzing age at onset against current age groups

Disorder	Empirical estimation score
Depressive episode	85.5
Manic episode	55.8*
Schizophrenic	65.5*
Generalized anxiety	100.0
Panic	41.7*
Phobic	100.0
Obsessive-Compulsive	100.0
Alcohol abuse	95.0
Alcohol dependence	66.5*
Drug dependence	38.8*
Tobacco dependence	100.0
Pathological gambling	78.6
Antisocial personality	33.3*

* Significant deviation from the expected estimation score. The deviation is more than 30.0 (100 minus the empirical estimation score).

sodes are severely underestimated. Phobic and antisocial personality disorders are moderately underestimated.

As judged by analyzing age at onset against current age group, the deviations in estimation of lifetime prevalence are shown in Table 5 for 13 disorders. Several disorders such as manic episode, schizophrenic disorder, panic disorder, alcohol dependence, drug dependence and antisocial personality disorder show significant underestimation.

The deviation judged by recency of illness for each disorder is illustrated in Table 6. Depressive episode, manic episode and phobic disorder were significantly underestimated. By considering all three indicators together (Table 7), the lifetime prevalence of manic and depressive episodes is found to be seriously underestimated. Moderate underestimation of lifetime prevalence is found in schizophrenic, panic and phobic disorders.

Table 6
Deviation in estimation of lifetime prevalence by analyzing recency of illness

Disorder	Recency ≤ 1 year (case number)	Recency > 1 year (case number)	Recency ratio score (> 1 year/ ≤ 1 year)	Recency ratio score expected	Degree of deviation
Depressive episode	32	12	0.38	> 1.00	3
Manic episode	6	2	0.33	> 1.00	3
Schizophrenic	13	1	0.08	0.50	2
Generalized anxiety	164	17	0.10	0.50	2
Panic	9	1	0.11	0.50	2
Phobic	125	23	0.18	1.00	3
Obsessive-Compulsive	11	3	0.27	0.50	1
Alcohol abuse	50	44	0.88	1.00	0
Alcohol dependence	33	28	0.85	1.00	0
Drug dependence	2	1	0.50	0.50	0
Tobacco dependence	286	69	0.24	0.50	1
Pathological gambling	14	10	0.71	0.50	1
Antisocial personality*	-	-	-	-	-

* Lack of available data for analysis.

Table 7
Number of indicators with significant deviation in underestimation for lifetime prevalence

Disorder	No. indicators with severe deviation (total 3)	Serious underestimation of lifetime prevalence
Depressive episode	2	yes
Manic episode	3	yes
Schizophrenic	1 (2)*	moderate
Generalized anxiety	0	no
Panic	1 (2)*	moderate
Phobic	1 (2)*	moderate
Obsessive-Compulsive	0	no
Alcohol abuse	0	no
Alcohol dependence	1	no
Drug dependence	1	no
Tobacco dependence	0	no
Pathological gambling	0	no
Antisocial personality	1 **	moderate

* Assessment made by including the indicators with severe or moderate degree of deviation. (2) indicates two indicators with severe or moderate degree of deviation.
** Only two indicators available for analysis.

Discussion

Using well-established data on age at onset and clinical course of a specific disorder to test the estimated lifetime prevalence reached by DIS-CM interview offers a new method for examining the validity of DIS-CM in epidemiological study. The analysis of diagnostic agreement between DIS-CM and psychiatrist's diagnoses supported the procedural validity of DIS-CM. However, the specific diagnostic category diagnosed by DIS-CM requires detailed clinical studies to test the real nature of the identified cases. This study used the time factor, including age at onset, current age, and recency of illness, to investigate the disease nature of each diagnostic category. This might be coded as a construct validity study for DIS-CM.

The empirical clinical data (age at onset, current age and recency of illness) were analyzed to test how good the DIS-CM is for estimating lifetime prevalence. It is interesting to find that episodic psychiatric disorders, such as depressive and manic episodes, have been seriously underestimated, and panic and phobic disorders moderately underestimated. These two disorders also have a strong tendency to be episodic. The other two categories with moderate underestimation of lifetime prevalence are schizophrenic disorder and antisocial personality. Schizophrenic disorder which is the most serious illness clinically, is characterized by deteriorated overall judgement in social life and impaired insight into the illness. This may reduce the power of DIS-CM for estimating lifetime prevalence in schizophrenic disorder. This has also been reported by other researchers (9) and also found by our previous

study on disagreement between DIS-CM and clinical diagnoses. Subjects with antisocial personality disorder are usually uncooperative. They may not have wanted to continue with the research and dropped out of the study sample. If they were interviewed they might not have given a true report of their past life experiences. These factors could cause the DIS-CM to underestimate the prevalence of this disorder.

All disorders have the lowest prevalence in the oldest age group. The high mortality of the oldest group with psychiatric disorders, general impairment in memory function, and reduced flexibility in interpersonal relationship resulting from aging, may interfere with DIS-CM interviews and be possible factors explaining this phenomenon. The lifetime prevalence of episodic disorders was found to be seriously underestimated. Usually, these disorders run a smooth course after the acute episode. Subjects with this type of illness may have a good remembrance of recent suffering, but past suffering is forgotten. These subjects may have a passive psychological resistance to reporting that these past experiences had any significance in their life. Besides, to report past suffering due to psychiatric illness may represent personal weakness and raise active psychological resistance. Thus, subjects may avoid giving the correct answers to symptom questions in the DIS-CM interview. All scientific approaches to eliciting past life events are subject to these kinds of unavoidable problems interfering with data collection. Thus, we should be aware of this beforehand to allow the least possible error. In addition, we have to be aware of the extent of the bias produced by these factors.

The assumption of absence of culturally determined etiological factors in the disorders studied, may render the analyses defective. It could be argued that man may not have been affected by certain disorders at various times during the last 70 years. If this is true, there is no means of anticipating the increasing lifetime prevalence with increased age, and the full range of age-at-onset and RRS should be lower than anticipated figures presented in Table 6. However, apart from alcohol and drug abuse, we have no reason to suppose the absence of the remaining 11 disorders during that time. Alcohol and drugs were not readily available during the Second World War in Taiwan under Japanese occupation. However, that was a relatively short period and it is not likely to influence such analyses. Moreover, the means of assessment of deviation used a 4-point scale (0–3), requiring the concurrence of, at least, 2 of 3 indicators to determine severe underestimation, and there was plenty of allowance for the effect of minor errors in the significance intervals. Thus, the final assessment of underestimation of lifetime prevalence should not be greatly distorted.

The adoption of clinical data from the developed countries might, from a cross-cultural point of view, also be argued to be a methodological weakness of this study. In fact, there is no systematically reported empirical data on the age of onset and clinical course of the various psychiatric disorders in Taiwanese patients. However, from clinical experience and the data shown in the International Pilot Study of Schizophrenia (10), the age of onset and clinical course of Taiwan Chinese patients do not appear to differ significantly from those described in Western literature, and, thus, comparative use of this data may not have caused too much bias in the present study.

It is concluded that the lifetime-prevalence data obtained by using DIS-CM is very conservative, that depressive and manic episodes are seriously underestimated, and that adjustment for lifetime-prevalence figures is necessary in both the practical and theoretical sense. On the basis of this study, it may be necessary to double or even triple the observed prevalence figures for depressive and manic episodes. The observed figures for schizophrenia, panic, phobic, and antisocial personality disorders also probably need upward adjustment by a factor of one and a half or two for a correct estimate of their lifetime prevalence. As shown in Table 6, the majority of cases in the various diagnostic categories are within the 1-year period. The prevalence data for the recent 1-year period reached by using DIS-CM may be more reliable and more useful for clinical practice, research, and mental-health planning applications.

Conclusion

The lifetime prevalence of 13 diagnostic categories was examined by age group, age at onset, and recency of illness. Assessment of depressive and manic episodes by DIS-CM showed serious underestimation of lifetime prevalence, and schizophrenic, panic, phobic and antisocial personality disorders showed a probably significant underestimation. The methods used in this study for analysis of generalized anxiety disorder, obsessive-compulsive disorder, alcohol abuse and dependence, drug dependence, tobacco depend ence, and pathological gambling provided reliable estimates. Disease nature, recall effect, active and passive psychological resistance, mortality, uncooperative attitude are considered as possible factors inducing the underestimation of lifetime prevalence by DIS-CM interview. It is suggested that the recent 1-year period prevalence data obtained by using DIS-CM interview may be the most reliable for use in clinical practice, research and mental-health planning.

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