CORNELL MEDICAL INDEX AS A HEALTH MEASURE IN EPIDEMIOLOGICAL STUDIES

A TEST OF THE VALIDITY OF A HEALTH QUESTIONNAIRE

BY

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The Cornell Medical Index (CMI) is a well-known health questionnaire, of established value as an aid to clinical diagnosis and as a screening procedure (Brodman, Erdmann, and Wolff, 1956).

A recent review of the use of the CMI as an epidemiological tool cites numerous studies which support its value for this purpose, particularly as an indicator of emotional ill-health (Abramson, in press). The questionnaire has been shown to have a fair validity as a measure of the presence and degree of emotional disorder; this has been the common finding of a number of investigators in Britain and the United States, despite the lack of unison on definitions or criteria of mental health and illness. The CMI is possibly also of use as an index of general health; it appears, however, to have less value as an indicator of general somatic health or of the presence of specific disorders.

The use of the CMI in comparative studies presents problems. There is evidence that the questionnaire is of little value in comparisons of widely divergent cultures, and there are indications that problems of comparative validity may also arise when it is used in comparing groups within a single general culture. A study of apparently healthy US army inductees of differing ethnic origins, for example, revealed corresponding differences in their CMI responses (Croog, 1961).

This study was undertaken during 1962-4 among 120 randomly selected residents of a Jerusalem housing project. Its purpose was to test the validity of the CMI when applied in this community. The responses to the questionnaire were considered in relation to health appraisals made for this purpose by two physicians who were well acquainted with the

subjects. Attention was directed to the influence on the validity of the questionnaire of a number of variables commonly utilized in epidemiological studies—age, sex, ethnic group (region of birth), educational level, and social class.

The CMI comprises 195 questions, which are answered "yes" or "no". Each "yes" response indicates that the subject claims the presence, currently or in some instances previously, of a stated symptom or disorder. The questionnaire consists of eight sections (A to H) which deal, respectively, with the eyes and ears, the respiratory system, the cardiovascular system, the digestive tract, the musculoskeletal system, the skin, the nervous system, and the genito-urinary system; four sections which deal with fatigability, the frequency of illness, miscellaneous diseases, and habits; and six sections (M to R) which deal with mood and feeling patterns.

MATERIAL AND METHODS

THE CMI DATA

The CMI questionnaires were administered by trained interviewers, usually in the subject's home. A Hebrew version was used (Kark, Zaslany, and Ward, 1963).

The analysis was mainly based upon the total CMI score, *i.e.* the total number of "yes" responses. This score has been shown empirically to be a useful indicator of the presence and degree of emotional ill-health; it has been shown also to bear a relationship to various non-specific measures of overall health, such as attendances for medical care, work absences, and overall functional capacity (Abramson, in

press). The use of a critical scoring level of 30 has been recommended. Scores of 30 or over are referred to below as "high" CMI scores.

There was a fairly strong correlation, in this study, between the total CMI score and two other scores derived from the CMI, of which more limited use was made in the analysis. These other scores are:

The M-R score, *i.e.* the number of "yes" responses to sections M to R of the CMI, which deal with mood and feeling patterns. This score has also been found a useful indicator of emotional ill-health.

An "areas" score, *i.e.* the number of sections of the CMI, among sections A to H, which elicited at least three "yes" responses. This is a measure of the scatter of complaints through various diagnostic areas, indicating a diffuse medical problem. A similar measure of scatter has been found to discriminate between persons with different degrees of emotional illness (Lawton, 1959).

The coefficients of rank correlation between the total CMI score and these other scores were:

Score	Women	Men
M-R	0.68	0.76
"Areas"	0.77	0.87

In addition, consideration was given to the responses to a number of questions which refer to named disorders, such as "Have you ever had piles (rectal haemorrhoids)?" and "Has a doctor ever said your blood pressure was too high?"

HEALTH APPRAISALS BY PHYSICIANS

Appraisals of the subjects' health were made by two physicians (L.T. and J.G.B.) working in a family and community health centre which had been providing a comprehensive curative and preventive service to the study neighbourhood since 1953. These physicians had worked in this practice for 10 and 3 years respectively. Their appraisals were based upon their own knowledge of the patients, supplemented by the centre's clinical records. The few patients whom they did not know well were excluded from the study. Most (66 per cent.) of the subjects included had lived in the housing project for at least 10 years, and only 11 per cent. for under 5 years. On average, the study subjects had attended the health centre eight times during the previous two years (median figure). The majority of the appraisals were made jointly by the two physicians; 9 per cent. were made by the senior physician alone.

The physicians made their appraisals without knowledge of the subjects' CMI responses. The

appraisals were usually performed many months after the administration of the CMI, the interval being under 6 months in only 2 per cent. of the cases, 6-11 months in 14 per cent., 12-17 months in 52 per cent., and 18-26 months in 32 per cent.

The physicians made appraisals of each subject's current emotional health status and state of overall health, and reported whether the subject had, or had had, the specific disorders mentioned in the CMI questionnaire.

Appraisals of emotional health were made in terms of the following grades (MacMillan, 1957):

- I. Appears quite well (or minimal emotional disturbance).
- II. Shows minor, but not disabling, symptoms.
- III. Appears to need help with emotional problems.
- IV. Is emotionally disturbed—definitely needs help.

Among the 66 persons in Grades III and IV, the disorders most frequently reported were anxiety states (53 per cent.), depression (30 per cent.), personality disorders (23 per cent.), and hypochondriasis (11 per cent.); psychoses were specified in 3 per cent; multiple diagnoses were frequent.

The appraisals of overall health were made in terms of the following grades:

- I. Appears quite well (or minimal illness).
- II. Is mildly ill.
- III. Is moderately ill.
- IV. Is severely ill.

Illustrative Cases

Grade I: Recurrent upper respiratory infections. Mild flatfoot and arthralgia.

Grade II: Moderate hypertension and obesity. Cervical erosion, mild recurrent bronchitis, slight depression.

Grade III: Hypertension, recurrent arthralgia, and anxiety neurosis. Peptic ulcer, anaemia, and chronic anxiety.

Grade IV: Metastatic breast carcinoma. Hypertension, myocardial infarction, central retinal vein thrombosis, and an anxiety state.

THE SAMPLE AND ITS CHARACTERISTICS

The study was performed in a housing project established in 1951-52 in the western region of Jerusalem, and occupied by 449 families.

The persons studied comprised a random sample

of the adults (20 years and over) in the neighbourhood, selected by a two-step stratified sampling technique designed to produce a 1 in 6 random sample. By the vagaries of chance, this technique, which was applied for other purposes and to a population considerably larger than that included in the present study, produced in this neighbourhood a sample of 88 women (1 in 5.6 of the women in the area) and 54 men (1 in 8.0). Data were available for 78 women (89 per cent.) and 42 men (78 per cent.). The main reasons for exclusion were: moved away (8); not well known to physicians (8).

All but two of the subjects studied were immigrants, 82 per cent. having reached Israel between 1948 and 1951. They were of diverse origins: 44 per cent. were born in North Africa, 31 per cent. in the Middle East, and 25 per cent. in Europe. They ranged in age from 20 to 75 years, 40 per cent. being 40 years or over. On the basis of an occupational rating (Kark, Peritz, Shiloh, and Slome, 1964) similar to that used by the Registrar General of England and Wales, 6 per cent. were in Social Classes I and II, 57 per cent. in Class III, and 28 per cent. in Classes IV and V; 9 per cent. were unclassifiable. There was a wide variation in educational level: 27 per cent. had had no formal education, whereas 15 per cent. had had 12 or more years. All were Jewish.

There is a considerable amount of psychiatric disorder in the neighbourhood studied. A recent study has estimated the prevalence of emotional disturbances among adults to be at least 20.8 per cent. (Hoek, 1964).

STATISTICAL METHODS

The validity of a defined CMI response as an indicator of ill-health (as reported by the physicians) was expressed in terms of its sensitivity and specificity. Sensitivity was defined as the proportion of unhealthy persons who gave the defined CMI response, and specificity as the proportion of healthy persons who did not give this response.

Non-parametric methods were used in the statistical analysis: Kendall's rank correlation coefficient and the Mann-Whitney U test (Siegel, 1956), and the summary χ^2 test described by Mantel and Haenszel (1959). This latter test measures the significance of an association between two variables, after adjusting for possible effects connected with other variables. The 5 per cent. level of significance (two-tailed) was used.

FINDINGS

The responses to individual CMI questions referring to named disorders were not very valid

indicators of the presence of these disorders (Table I).

Of the persons whom physicians reported as having a specific condition, only about one-half, or less than one-half, themselves reported its presence. The disorders were, however, seldom reported by persons whom the physicians stated were free of them.

TABLE I
VALIDITY OF
CMI RESPONSES REGARDING SPECIFIC DISORDERS,
IN RELATION TO PHYSICIANS' REPORTS

Disorder	No. of Cases Reported by Physicians	Validity of CMI Responses (per cent.)	
		Sensitivity*	Specificity†
Heart disease	37	35	99
High blood pressure .. .	29	52	93
Overweight	29	55	91
Varicose veins	21	24	93
Kidney or bladder disease ..	20	30	97
Anaemia	16	56	80
Piles	12	50	81
Tumour or cancer	12	42	99
Liver or gall bladder disease ..	10	50	92

This Table includes all specific disorders named in the CMI, of which at least ten cases were reported by the physicians.

* Sensitivity = proportion claiming the presence of the disorder, among persons reported by the physicians to have the disorder.

† Specificity = proportion not claiming the presence of the disorder, among persons not reported by physicians to have the disorder.

Scores based upon the number of "yes" responses to the questionnaire were significantly correlated with the physicians' ratings of emotional and overall ill-health (Table II).

TABLE II
COEFFICIENTS OF RANK CORRELATION BETWEEN
VARIOUS CMI SCORES* AND PHYSICIANS' RATINGS OF
EMOTIONAL AND OVERALL HEALTH

CMI Score	Correlation with Health Ratings			
	Emotional		Overall	
	Women	Men	Women	Men
Total	0.38	0.37	0.48	0.45
M-R	0.31	0.38	0.37	0.26
"Areas"	0.39	0.40	0.42	0.47

Each of the coefficients shown in this Table is significantly different from zero; P values range from <0.02 to <0.00005.

* Defined under "Material and Methods".

The scores tended to rise with ratings of greater ill-health. The prevalence of total CMI scores of 30 or above, in relation to the physicians' ratings of ill-health, is shown in Table III (overleaf).

Estimates were made of the sensitivity and specificity of a total score of 30 or more as an indicator of emotional or overall ill-health, based upon the data

TABLE III

PREVALENCE OF TOTAL CMI SCORES OF 30 OR ABOVE, ACCORDING TO PHYSICIANS' RATINGS OF EMOTIONAL AND OVERALL HEALTH (BY SEX)

Physicians' Health Rating		No.		Percentage with Total CMI Scores of 30 or Above	
		Women	Men	Women	Men
Emotional	I	12	18	17	22
	II	19	5	58	(60)
	III	14	10	64	50
	IV	33	9	82	(89)
Overall	I	23	21	30	24
	II	26	10	73	40
	III	21	8	76	(100)
	IV	8	3	(88)	(100)

Percentages are based upon the number of persons of the specified sex with the specified health rating; those based upon fewer than ten persons are shown in parentheses.

shown in Table III. In relation to emotional ill-health, two separate sets of estimates were made, depending upon whether persons in emotional health Grade II (minor emotional symptoms, but not disabling) were considered, for this purpose, to be emotionally healthy or not. These estimates are shown in Table IV.

TABLE IV

SENSITIVITY AND SPECIFICITY OF A TOTAL CMI SCORE OF 30 OR OVER AS AN INDICATOR OF EMOTIONAL DISTURBANCE

Estimate of Persons in Emotional Health Grade II	Sensitivity* (per cent.)		Specificity† (per cent.)	
	Women	Men	Women	Men
(a) Considered as emotionally healthy	77	68	59	70
(b) Considered as emotionally disturbed	71	67	83	78

* Sensitivity=Proportion with a total CMI score of at least 30, among persons appraised by physicians as being in emotional health Grades III-IV (Estimate a) or II-IV (Estimate b).

† Specificity=Proportion with a total CMI score of under 30, among persons appraised by physicians as being in emotional health Grades I-II (Estimate a) or I (Estimate b).

In relation to overall ill-health, the specificity and sensitivity of CMI scores of this level were:

Sensitivity: 76 per cent. (women), 71 per cent. (men);

Specificity: 70 per cent. (women), 76 per cent. (men).

These estimates are based upon the CMI responses of persons whom physicians rated as, respectively, quite well (Grade I) or ill (Grades II-IV).

There was a moderate correlation between the physicians' ratings of emotional and overall health. The coefficients of correlation between the two ratings were 0.52 (women) and 0.57 (men); most (78 per cent.) of the persons rated as "ill" (overall

health ratings II-IV) were also rated as emotionally disturbed (Grades III and IV). However, the relationship between high CMI scores and an overall health rating of "ill" was independent of the emotional health rating; this was demonstrated by the summary χ^2 test, controlling for the emotional health rating in the analysis ($P < 0.025$).

The responses to ten selected "key questions" were also found to have considerable validity as an indicator of emotional ill-health.

These "key questions" were selected by estimating, for each CMI item, its liability to be answered "yes" by emotionally disturbed persons (Grades III and IV), in relation to its liability to be so answered by emotionally healthy persons (Grade I). The formula used in estimating this relative liability was

$$(N_1 + 0.5)(Y_2 + 0.5) \div (Y_1 + 0.5)(N_2 + 0.5),$$

where Y_1 and N_1 represent the numbers of persons in emotional health Grade I answering the question "yes" and "no" respectively, and Y_2 and N_2 the number in Grades III and IV answering "yes" and "no" respectively (Haldane, 1956). There were thirteen questions which, by this formula, were ten or more times more likely to be answered "yes" by emotionally disturbed persons. Three were discarded, two of them (dealing with bloody diarrhoea and the healing of skin cuts) on the grounds that their relationship to emotional health was remote, and one which, in its Hebrew version, was almost a duplication of another question. The following were the ten remaining "key questions"; the estimate of relative liability is stated in parentheses after each item.

Are you easily upset or irritated? (55)

Do you suffer from severe nervous exhaustion? (33)

Do you usually have great difficulty in falling asleep or staying asleep? (17)

Are you definitely under-weight? (12)

Do you often become suddenly scared for no good reason? (12)

Are you considered a nervous person? (11)

Are you constantly keyed up and jittery? (11)

Do you usually feel unhappy and depressed? (10)

Does life look entirely hopeless? (10)

Does every little thing get on your nerves and wear you out? (10)

There was a moderate correlation ($r = 0.63$) between the number of these questions answered positively, and the total CMI score.

The coefficient of correlation between the number of "key questions" answered "yes" and the physicians' ratings of emotional health was 0.40

among the women, and 0.62 among the men. Few persons in emotional health Grade I answered any of these questions positively, and few in Grades III and IV failed to give at least one "yes" response (Table V).

TABLE V

PROPORTION GIVING AT LEAST ONE POSITIVE RESPONSE TO TEN SELECTED "KEY QUESTIONS", ACCORDING TO RATINGS OF EMOTIONAL HEALTH (BY SEX)

Emotional Health Rating	No.		Percentage giving at Least One Positive Response*	
	Women	Men	Women	Men
I	12	18	25	6
II	19	5	63	(80)
III	14	10	79	70
IV	33	9	85	(100)

* See footnote to Table III.

On the basis of the data shown in Table V, estimates were made of the sensitivity and specificity of at least one positive response to a "key question", as an indicator of emotional disturbance (Table VI).

TABLE VI

SENSITIVITY AND SPECIFICITY OF AT LEAST ONE POSITIVE RESPONSE TO TEN SELECTED "KEY QUESTIONS" AS AN INDICATOR OF EMOTIONAL DISTURBANCE

Estimate*	Sensitivity (per cent.)		Specificity (per cent.)	
	Women	Men	Women	Men
a*	83	84	52	78
b*	77	83	75	94

* See Table IV

Among the women, these figures are fairly similar to the estimates of the sensitivity and specificity of a high total CMI score (Table IV); among the men, they are somewhat higher.

INFLUENCE OF OTHER FACTORS

In each sex, the total CMI score tended to be higher among persons aged 40 years or over, even when persons with the same health rating were compared (Figure). The significance of this association with age (independent of sex and health ratings) was demonstrated by the summary χ^2 method. A significant association ($P < 0.001$) was found between age (40 years or more, or below 40 years) and the occurrence of a high CMI score, when sex and the emotional health rating were controlled in the analysis; this applied to each sex. The association with age was significant also when sex and the overall health rating were controlled in the analysis ($P < 0.01$); this association was significant among the women, but fell short of significance among the men.

FIGURE—Median total CMI score, according to physicians' ratings of emotional and overall health.

The practical influence of this finding upon the validity of the CMI score as a health indicator in different age groups was demonstrated by the fact that in each age group below 40 years (20–29 and 30–39) the proportion rated by physicians as emotionally disturbed (Grades III and IV) exceeded the proportion with a high CMI score, while in each older age group (40–49, 50–59, and 60+ years) there was a converse finding. This applied in both sexes.

In order to explore the possible influence of other variables upon the validity of the CMI score, the occurrence of high scores in various sub-groups was compared, after standardization on the basis of the age and health ratings of the total sample (Table VII). The adjusted figures shown in this Table represent estimates of what the prevalence of high CMI scores in each sub-group would be, if the

TABLE VII

ADJUSTED* PROPORTION WITH TOTAL CMI SCORES OF 30 OR ABOVE IN VARIOUS SUB-GROUPS OF THE SAMPLE

Sub-Group		No.	Percentage with Total CMI Scores of 30 or Above		
			Crude Rate	Rate adjusted for Age and Health Rating	
				Emotional	Overall
Sex	Women ..	78	63	56	60
	Men ..	42	48	57	56
Years of Education	0 to 5 ..	43	67	59	59
	6 to 9 ..	40	48	56	54
	10 or More	37	49	61	62
Region of Birth	North Africa	53	51	62	53
	Middle East	37	81	49	52
	Europe ..	30	73	63	60
Social Class	I, II, and III	75	59	62	60
	IV and V ..	34	53	46	57

* Standardized according to the distribution by age and health ratings of the total sample.

sub-groups were similar in age and in their physicians' ratings of emotional or overall health.

High scores were, for example, commoner among women than among men; but this difference disappeared when the rates were adjusted in this way. This finding, together with the fairly similar findings for the two sexes shown in Tables II and III, suggests that in this sample sex had little or no influence on the validity of the total score as an indicator of the physicians' health rating.

The findings in Table VII similarly indicate that educational level had little influence upon validity. They suggest that the region of birth may have had such an influence. A summary χ^2 test (controlling for age and emotional health rating) indicated, however, that the association between region of birth and high CMI scores fell far short of significance (P = between 0.3 and 0.5).

The adjusted rates similarly suggest that social class had an influence upon the validity of the CMI as an indicator of the emotional health rating: the adjusted proportion with high CMI scores was higher in Social Classes I-III. By the summary χ^2 test, this difference too was not significant. However, among persons aged 40 years or over, the relationship between social class and high CMI scores (by the summary χ^2 test, controlling for emotional health rating) fell only just short of significance.

In view of this possible influence of social class, the relationship between age and the CMI score was re-examined, with social class, as well as the emotional health rating, controlled in the analysis. A highly significant relationship with age remained apparent ($P < 0.001$).

The influence of age, social class, and other factors upon the validity of the ten "key questions" was similar to their influence upon that of the total CMI score.

DISCUSSION

The findings confirm both the limitations and the possible value of the CMI in epidemiological studies. The questionnaire was of little value as an indicator of the occurrence of specific disorders; to some extent, this may have been due to the time lapse before the physicians made their reports—some cases may have been diagnosed only after the CMI had been administered. In general, however, this finding is similar to that of a large-scale New York study, in which it was found that CMI data "fed" to a data-processing machine provided correct diagnoses of sixty common disorders in only 44 per cent. of the cases with these disorders (Brodman, van Woerkom, Erdmann, and Goldstein, 1959). This

shortcoming does not of course detract from the value of the questionnaire as an aid to the clinician, when supplemented by more detailed interrogation and a clinical examination.

The total CMI score appears to be of fair validity in this population as an indicator of physicians' appraisals of emotional ill-health. Its sensitivity (using a cutting point of 30) is as high as, or slightly higher than, that in various groups studied in Britain and the United States (compare the figures shown in Table IV with those for emotionally disturbed patients in Table VIII). Its specificity is, however, possibly slightly lower than in Britain and the United States. Particularly among the men, the prevalence of high scores among emotionally healthy persons (*i.e.* 100 per cent. minus the specificity estimates shown in Table IV) more closely resembled that in various overseas samples of patients (other than psychiatric) than that in overseas samples of ostensibly healthy persons (Table VIII, opposite). This suggests that in this population there may be a greater tendency than in Britain and the United States for high CMI scores to reflect factors not directly connected with emotional health, such as culturally determined differences in the perception and reporting of symptoms. A greater prevalence of high CMI scores in this population than in a British or United States population need not necessarily indicate a higher prevalence of emotional disturbance.

It is of interest that ten selected "key questions" provided a valid indicator of emotional health ratings in the sample studied. Whether this applies to other samples also, and whether a briefer questionnaire based upon these questions is practicable, remain to be studied.

In this population the CMI is apparently of fair validity also as an indicator of physicians' appraisals of overall ill-health (of any degree), both the specificity and sensitivity of a high CMI score being 70 per cent. or more in each sex. Its sensitivity in this respect appears higher than elsewhere. Among medical and surgical hospital out-patients in New York, for example, only 23 per cent. (of men) and 44 per cent. (of women) had scores of 30 or above (Brodman, Erdmann, Lorge, Gershenson, and Wolff, 1952).

There are no agreed definitions or criteria for overall health or for emotional health. The present findings confirm, however, that in this population the CMI is fairly valid as an indicator of ratings of overall or emotional health made by physicians who are well acquainted with their patients. Of particular interest is the fact that the CMI was a valid predictor of health appraisals which were made, in most cases, over a year later.

TABLE VIII

PREVALENCE OF CMI SCORES OF 30 OR MORE IN VARIOUS SAMPLES STUDIED IN BRITAIN AND THE UNITED STATES

	Sample	Women	Men
Ostensibly Healthy Persons	Total	14%	10%
	Job applicants, cigarette factory, New York (Erdmann, Brodman, Deutschberger, and Wolff, 1953)	4% (201)	0% (205)
	New employees, New York Hospital (Brodman, Erdmann, Lorge, Gershenson, and Wolff, 1952)	5% (307)	3% (152)
	Ostensibly healthy persons, New York City (Brodman, Erdmann, Lorge, Gershenson, and Wolff, 1952)	30% (238)	10% (282)
	Army inductees, New York City (Brodman, Erdmann, Lorge, Deutschberger, and Wolff, 1954)	—	12% (2,176)
Patients (Non-psychiatric)	Total	41%	20%
	Patients not diagnosed as neurotic, London general practice (Brown and Fry, 1962)	26% (73)	12% (67)
	Medical and surgical out-patients (not diagnosed as neurotic), New York Hospital (Brodman, Erdmann, Lorge, Gershenson, and Wolff, 1952) ..	41% (2,671)	20% (1,924)
	Veterans admitted to general hospital, with no record of psychological disturbance or psychosomatic illness, Rhode Island (Lawton, 1959)	—	26% (43)
Emotionally Disturbed Patients	Total	67%	65%
	Veterans admitted to general hospital, with notation of nervousness or tension, or diagnosis of a psychosomatic illness, Rhode Island (Lawton, 1959) ..	—	40% (38)
	Veterans admitted to medical or surgical services, with previous diagnosis of psychiatric illness, Rhode Island (Lawton, 1959)	—	48% (25)
	Medical and surgical out-patients, with diagnosis of emotional disturbance, New York (Brodman, Erdmann, Lorge, Gershenson, and Wolff, 1952) ..	65% (343)	52% (183)
	Men rejected from army service on psychiatric grounds alone, New York City (Brodman, Erdmann, Lorge, Deutschberger, and Wolff, 1954)	—	59% (211)
	Patients with neurosis, London general practice (Brown and Fry, 1962) ..	72% (43)	68% (19)
	Psychiatric out-patients, Nebraska (Arnhoff, Strough, and Seymour, 1956) ..	79% (16)	69% (45)
	Veterans admitted to psychiatric service, Rhode Island (Lawton, 1959) ..	—	76% (34)
	Veterans treated in neuropsychiatric out-patient section, Brooklyn (Brodman, Erdmann, Lorge, Gershenson, and Wolff, 1952)	—	76% (371)
	Psychiatric hospital out-patients, London (Brown and Fry, 1962)	82% (38)	79% (28)

The combined prevalence in the various samples studied is shown in bold type. The sample size is shown in parentheses after each percentage.

The validity of the CMI was found to be influenced by age, and possibly by social class. These findings can be differently interpreted. From a pragmatic point of view, however, the important conclusion is that, in this population, a comparison of the CMI responses of older and younger persons, or of persons in different social classes, might not give the same picture of their differences in health state, as would health appraisals by physicians.

Sex, educational level, and ethnic group (region of birth) appeared to have little or no influence upon the validity of the CMI in the sample studied. It may be noted that many studies, mainly in Britain and the United States, have revealed a tendency for women to have higher CMI scores than men. It has been suggested that this difference may be culturally determined, and that it may be more acceptable for women in these countries to complain than it is for

men (Brodman, Erdmann, Lorge, and Wolff, 1953; Culpan, Davies, and Oppenheim, 1960; Steinhardt, Zeman, Tuckman, and Lorge, 1953). The apparent lack of influence of ethnic group is possibly surprising, in view of the many overt behavioural differences between persons of different geographical origins in Israel. It may be that a stay of over 10 years in the Israeli melting-pot, or exposure to a single medical service, has a marked levelling effect on ethnic differences in health behaviour.

The findings concerning the influence of these factors upon the validity of the CMI are not necessarily applicable elsewhere. The generalization can, however, be made that in any population, the CMI should not be used as the sole evidence of group differences in health, unless there is some indication that its validity is similar in the groups compared.

This generalization does not, of course, apply to the CMI only. The findings of this study may be construed as supporting the trite but often neglected admonition that no health measure, be it a questionnaire, a clinical finding, or a laboratory test, should be used in comparing the health of groups without an assurance that it is of comparable validity in the groups compared.

SUMMARY

The validity of the Cornell Medical Index (CMI) health questionnaire was tested in a Jerusalem housing project in 1962-4. The questionnaire was administered to a random population sample, and the responses were considered in relation to independent health appraisals made by physicians who were well acquainted with the subjects.

The questionnaire was of little value as an indicator of the occurrence of specific disorders, but of fair validity as a predictor of physicians' appraisals of emotional and overall health. Its specificity as an indicator of emotional ill-health was possibly slightly lower than in Britain or the United States.

Ten "key questions" were selected, which provided a valid indicator of physicians' ratings of emotional health.

The validity of the CMI was influenced by age, and possibly by social class. Sex, educational level, and ethnic group (region of birth) appeared to have little or no influence upon its validity.

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