Original Articles

The Meaning of Cognitive Impairment in the Elderly

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In order to determine the meaning of cognitive impairment in community dwelling elderly, 3,481 adults were interviewed in their homes using the Mini-Mental State Examination. Ninety-six per cent of the population aged 18–64 scored 23 or higher, whereas 80 per cent of the population 65 and over scored 23 or higher. Individuals with low scores were suffering from a variety of psychiatric disorders including dementia. Thirty-three per cent of the elderly population scoring in the range of 0–23 had no diagnosable DSM-III condition. Prevalence of dementia from all causes was 6.1 per cent of the population over age 65. Two per cent of the population over age 65 were diagnosed as having Alzheimer's disease. *J Am Geriatr Soc 33:228, 1985*

Cognitive impairment may be defined as a diminished capacity to know the world. In clinical medicine, cognitively impaired patients are classified by particular groups of signs and symptoms. The syndromes of dementia, mental retardation, aphasia, amnesia, and delirium are all characterized by cognitive impairment. By *dementia* we mean a global *deterioration* of intellectual functioning in clear consciousness. Dementia is distinguished from mental retardation in which cognitive impairment is life-long, from aphasia and amnesia in which language and recent memory are specifically and disproportionately affected, and from delirium in which cognitive impairment occurs in the setting of clouded consciousness. (See Appendices 1–3 for DSM-III Diagnostic Criteria.)

After cognitive impairment is identified and classified in terms of signs and symptoms by clinicians, they search for the cause and mechanism of the impairment, that is, the way in which abnormal structure or function of the organism lead to the impairment. Suggestive evidence of cause and mechanism is obtained by the clinical methods of history-taking, examination of the present state, and laboratory procedures. In some cases, autopsy is required to reveal pathologic features of stroke or pathologic features of Alzheimer's disease. In other cases, evidence pertaining to drug use, occupational exposures, educational attainment, and other aspects of psychosocial life may lead to an understanding of mechanism.

These mechanisms by which cognitive impairment is produced are products of other causes. This can be seen clearly by considering *dementia pugilistica*, an endpoint in a causal linkage that includes physical trauma as well as sociocultural values that endorse and encourage careers in the sport of boxing. Similarly, the culture-specific practice of cannibalism by the Fore people in New Guinea has led to the transmission of Kuru virus and its associated dementia. More commonplace examples can be seen in societies which permit or even encourage hazardous practices such as sustained heavy drinking, or the transport of infants in automobiles without crash protection.

In addition to classification by symptoms and pathology, it has been traditional to classify cognitive impairment as reversible or irreversible, chronic or acute. Moreover, cognitively impaired individuals often are classified in terms of requirements for long-term care, legal status, and eligibility for disability payments.

The definition and clinical criteria for cognitive impairment must be distinguished from the means

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of measuring it. Measurement can be developed from different points of view depending upon its purpose. Cognitive impairment can be measured by formal psychological tests, such as the Wechsler Intelligence Test, the Wechsler Memory Test, particular achievement tests, and tests of language and motor skill function. These tests offer the great advantages of standardized procedure, quantification, and cumulative knowledge based on experience. However, they usually have the disadvantages of being lengthy, of being aimed at a population with a high degree of training such as college students, and of being focused on particular deficits of theoretical importance without regard to the types of impairment associated with disability. Furthermore, these tests typically do not measure deterioration in cognitive functioning, except by repeated testing.

Accompanying the development of these formal tests has been the concomitant development of other tests called clinical aids to the examination of subjects. Early versions include methods used by the immigration office to screen immigrants at the turn of the century and the format for the examination of the mental state developed by Adolph Meyer in 1917. Derivatives of these clinical aids have been used in population surveys and include the mental status questionnaires used in the US/UK cross-national study and the Duke longitudinal study, as well as the Memory and Information Test of Roth and Hopkins that was used in the Newcastle population study.[2-4]

The advantage of these clinical aids is their brevity and comparatively high face validity and interpretability. For example, a simple test of orientation to place can directly indicate that a patient does not fully know the world. Inability to remember nonsense syllables in a formal test is not as readily interpretable. However, the clinical aids also have clear disadvantages, including a lack of theoretical foundations to facilitate generalization.

The Mini-Mental State Examination (MMSE) is a clinical aid that measures cognitive impairment and is based upon many items drawn from previous clinical aids.[5] Appendix 4 shows the items of the examination. The MMSE has been shown in clinical situations to have high inter-rater reliability, and to be significantly correlated with other tests of neuropathology revealed by the CAT scan and EEG.[6] Because MMSE items were drawn from previous tests, it has reasonably high correlations with those tests, but there are several MMSE items that have not appeared in previous clinical aids. These include the language and motor skills items.

The remainder of this paper will present and discuss the estimated distribution of Mini-Mental State Examination scores by age, as found in the Eastern Baltimore Mental Health Survey as part of The Epidemiologic Catchment Area (ECA) study, and preliminary results from the clinical and laboratory work-up of subjects with low scores who had clinically diagnosed dementing illnesses.

Methods

THE SAMPLE AND METHODS OF MEASUREMENT

The population studied was that of eastern Baltimore, an area with an adult population (18 and over) of 175,000. This is an area with diversity in housing and inhabitants. About 38 per cent of the population designates itself as non-white in racial and ethnic origin. The area's median annual household income is between $10,000 and $16,000, with a broad range. Additional details about the sampled area and its population as well as the methods of the basic study are presented in this issue in the article by Kramer et al.[7] (pages 236–245).

The data on which this paper is based have been gathered in each of three phases of the Eastern Baltimore Mental Health Survey. In the first phase, a probability sample of adult household residents was taken and 3,481 participating subjects were interviewed by trained survey research interviewers who administered the NIMH Diagnostic Interview Survey along with its version of the Mini-Mental State Examination. The interview completion rate for this phase was 78 per cent.

In the second phase, all individuals likely to have a DIS diagnosis and 17 per cent of the subjects with no DIS diagnosis were invited for second examination by a psychiatrist. Of 1086 sampled subjects, 810 were examined by psychiatrists who used standardized clinical methods to make standardized clinical diagnoses of mental disorders according to the pre-specified criteria of the Diagnostic and Statistical Manual, Third Edition, of the American Psychiatric Association (DSM-III).[8] The examination completion rate in this phase of the study was 810/1086, or 75 per cent.

In the third phase of the study, all subjects diagnosed by a psychiatrist as having a definite or possible dementia syndrome were recruited for participation in a clinical and (when possible) laboratory work-up for differential diagnosis of the dementing illness. Thirty-six of 44 subjects with definite or possible dementing illness participated in a complete clinical and laboratory work-up by a neurologist who conducted a neurologic history and examination, and who completed laboratory testing that included blood tests for syphilis, hypothyroidism, and B_{12} deficiency; a CT scan; and an EEG.

TABLE 1. Mini-Mental State Examination Scores*: Estimated Cumulative Percentage Distributions for Eastern Baltimore Household Residents by Age

	Age (years)	
MMSE Score	18–64	65+
0	0.0%	0.0%
1	0.0	0.1
2	0.0	0.2
3	0.0	0.2
4	0.0	0.2
5	0.0	0.2
6	0.0	0.3
7	0.0	0.3
8	0.0	0.4
9	0.0	0.6
10	0.1	0.6
11	0.1	0.9
12	0.2	0.9
13	0.2	1.7
14	0.3	1.8
15	0.4	3.0
16	0.5	4.3
17	0.6	5.0
18	0.8	7.2
19	1.1	9.0
20	1.3	11.7
21	1.7	14.3
22	2.8	17.3
23	4.2	20.8
24	5.7	25.4
25	8.2	30.6
26	11.4	40.5
27	19.7	52.2
28	37.5	71.0
29	65.1	87.3
30	100.0	100.0
Unable or unwilling to complete test	1.6%	5.8%
Unweighted number of subjects	2558	923

* Based on household interview MMSE; subjects with less than nine years of school.

Review of records from this examination and of other medical records took place in a diagnostic conference that ended with differential diagnosis for the dementing illness. In addition, the detailed records from the 90- to 180-minute clinical examination conducted by the psychiatrists in phase 2 permitted a limited work-up-by-record and differential diagnosis for the remaining subjects. Additional details on sampling in phase 1 and phase 2 of the EBMHS are presented in Folstein et al.[9]

ANALYTIC APPROACHES

The MMSE has been scored by means of a computer program based upon the clinical scoring rules for the test. This program was written for use in the ECA Program and its algorithm is not exactly the same as the clinical scoring rules, though there is a substantial intercorrelation between the scores produced by each method ($r = 0.9$).

The MMSE values can range from 0 to 30, with 30 indicating no errors on the test. In the original clinical work with the MMSE, a low score was defined as 0–23. For the purposes of the initial analyses of ECA population data, a low score has been defined as 0–17. This paper presents results for both low score ranges.

Except as noted explicitly, all estimates shown in this paper have been weighted to compensate for differences in probabilities of sample selection.

Results and Discussion

Table 1 shows the distribution of Mini-Mental scores in the adult household population of Eastern Baltimore in relation to age, as determined by testing in the phase 1 interviews of this survey. These are scores obtained through administration of the MMSE in a household interview. No differences were found between males and females and blacks and whites of equal education and age. Compared with younger persons, a greater proportion of individuals age 65 and over have lower scores on the test (defining the low score range as either 0–17 or 0–23). However, the aged are much more likely to have lower levels of education than younger individuals. Thus, Table 2 shows the relationship between age and MMSE score for persons with less than nine years of education, and again a greater proportion of elderly individuals have low scores. Even though it is not possible to be confident that the education of the old was comparable with the education of the young, this crude comparison suggests that the excess of low MMSE scores in the elderly population is not simply an educational effect.

Another possible explanation of the difference is that some of the older individuals are suffering from diagnosable mental disorders that are associated with a low score. Table 3 indicates the relationship between the household MMSE score and psychiatrists' standardized diagnoses of mental disorders made according to DSM-III diagnostic criteria after direct clinical examinations of elderly subjects in the second phase of the study. That is, the table gives the prevalence of various diagnoses among groups who scores were at various levels on the MMSE. The psychiatrists made these diagnoses after they had administered the clinical MMSE, but without knowledge of the household MMSE score. Many of the elderly subjects with low scores

had mental disorders in the DSM-III categories. This is true when the low score range is defined as 0–17 and also when it is defined as 0–23. In addition, it shows that several different DSM-III disorder categories are associated with these low scores.

All subjects with a phase 2 clinical diagnosis of Alzheimer's disease or multi-infarct dementia scored 23 or less on the household MMSE.

A substantial proportion of the elderly subjects with low scores had no diagnosed DSM-III condition.

In the more thorough examination undertaken for the third phase of the study (the Differential Diagnosis) several disorders were found to be present among the 36 examinees. The sample is described in Table 4. The most frequent disorders of cognition in this group were Alzheimer's disease (n = 12), multi-infarct disease (n = 6), and dementias of mixed or undetermined etiology (n = 3). The remaining examinees received conference diagnoses of possible dementia (n = 6), or dementia not confirmed. The study criteria for Alzheimer's disease and for multi-infarct disease are given in Appendix 2. In this sample it is of interest that no cases of curable dementia were found, suggesting that the curable dementing illnesses have a very low prevalence in the general community although they are observed in a clinical situation in 10–20 per cent of cases examined.[10]

Preliminary estimates for the prevalence of Alzheimer's disease only and multi-infarct disease only in the household population of Eastern Baltimore suggest rising prevalence with age as shown in Table 5. There is a great increase from age 65–74 to age 75+. (The oldest person in the sample was 96.) These estimated values are within the ranges specified for severe disorders of cognition in other populations, such as the elderly household population surveyed by Kay, Beamish, and Roth in Newcastle-upon-Tyne.[11]

The overall rates for dementia found in this survey are similar to the rates reported in Syracuse by Gruenberg and in Newcastle by Kay et al. The predominance of multi-infarct dementia (MID) over Alzheimer's disease (AD) cases was unexpected, since previous surveys suggested that Alzheimer's disease should be a more common disorder than multi-infarct dementia. There are several possible explanations. The *first* regards diagnostic criteria. With the DSM-III criteria used in this study, it is likely that the patients diagnosed as having AD do not indeed suffer from MID but, in fact, patients diagnosed as having MID might have AD in addition. The *second* explanation is the marked differences in the composition of the Eastern Baltimore population, with its higher proportion of black subjects, who are likely to experience a higher prevalence of hypertension and, with that, MID.

TABLE 2. Mini-Mental State Examination Scores*: Estimated Cumulative Percentage Distributions for Eastern Baltimore Household Residents by Age

MMSE Score	Age (years) 18–64	65+
0	0.0%	0.0%
1	0.0	0.2
2	0.0	0.2
3	0.0	0.2
4	0.0	0.2
5	0.0	0.2
6	0.0	0.4
7	0.0	0.4
8	0.0	0.6
9	0.0	0.8
10	0.0	0.8
11	0.0	1.4
12	0.5	1.4
13	0.5	2.6
14	0.9	2.6
15	1.1	4.5
16	1.4	6.3
17	1.9	7.3
18	2.5	10.6
19	3.9	12.8
20	4.5	16.7
21	5.9	20.6
22	9.9	24.4
23	15.8	29.4
24	20.1	34.2
25	26.5	40.8
26	31.3	52.1
27	44.9	63.6
28	63.5	80.1
29	85.5	92.6
30	100.0	100.0
Unable or unwilling to complete test	5.0%	7.7%
Unweighted number of subjects	426	564

* Based on household interview MMSE.

Cognitive impairment has many meanings and many implications. For future research, cognitive impairment itself could be used as an indicator of a population studied for the utilization of resources, mortality rates, and financial assistance. The neurologic disorders that are associated with cognitive impairment would have different meanings if used to designate populations for study of resource utilization or mortality rates. For example, patients with multi-infarct dementia often suffer from hypertension and often require cardiac medications. Patients with Alzheimer's disease are often free of

TABLE 3. Prevalence Rate of Clinically Diagnosed DSM-III Conditions Among Subjects Aged 65+ in the Eastern Baltimore Mental Health Survey, by Household MMSE Score*

Mental Disorders Diagnosed According to Criteria of the Current Diagnostic and Statistical Manual (DSM-III)	Mini-Mental State Exam Scores			
	Lower Score 0–17 (*n* = 35)	Higher Score 18–30 (n = 193)	Lower Score 0–23 (n = 121)	Higher Score 24–30 (n = 107)
Dementias	51.4%	7.3%	26.4%	0.0%
Delirium	11.4	1.6	5.0	0.9
Mental retardation	0.0	1.0	1.7	0.0
Major affective disorders	0.0	1.6	0.0	2.8
Other psychotic disorders	0.0	1.0	0.8	0.9
Other affective disorders	2.9	5.2	5.0	4.7
Neurotic disorders	11.4	15.5	13.2	16.8
Alcohol use disorder	2.9	3.1	4.1	1.9
Other drug use disorder†	0.0	0.5	0.0	0.9
No DSM-III condition†	14.3	52.3	33.1	61.7

* Phase 2 Clinical Reappraisal sample statistics, unweighted.
† Not counting DSM-III tobacco dependence.

other somatic disorders. One would expect, therefore, that these two cognitively impaired groups would require different types of health care. Thus, the meaning of cognitive impairment as an objective syndrome should be distinguished from the neurologic diseases, such as Alzheimer's disease, that cause the syndrome and from the social conditions, such as lack of education, that can limit the expression of cognitive capacity and perhaps limit cognitive capacity as well.

Conclusion

In conclusion, these preliminary results show that the cognitive impairment measured among household residents in eastern Baltimore is a frequently occurring impairment that is associated with age even among persons with little schooling. Detailed clinical examinations reveal a number of associated mental disorders, as well as some individuals without diagnosed specific disorders.

Future research in this area should focus on the diversity of the meaning of cognitive impairment in the elderly and the broad range of possible sources of that impairment, including Alzheimer's disease. Standardized definition of "cognitive impairment" should be pursued in studies to allow comparison among them and to facilitate better methods of detecting and studying cognitive impairment and associated disorders in the community. The Mini-Mental State Examination is one approach to standard detection of cognitive impairment, but the evidence from this study and from prior studies[4,5] shows that the MMSE does not make a diagnosis. Rather, a low MMSE score indicates a need for further evaluation.

In the papers that follow in this volume, Kramer et al. show relationships between cognitive impairment and other characteristics of the elderly, such as household composition (pages 236–245), and German et al. show relationships between cognitive impairment and use of health and mental health services (pages 246–252).

TABLE 4. Characteristics of 36 Subjects Referred for Neurologic Examination because of "Possible Dementia"

	Male (*n* = 20)		Female (*n* = 16)	
Age	65–74	75+	65–74	75+
Race				
White	2	8	1	7
Black	5	5	1	7
MMSE				
0–17	2	2	2	9
18–30	5	10	0	4

TABLE 5. Age Specific Prevalence (%) of Dementing Illnesses in East Baltimore Household Population Age 65+

	Age (years)		All Persons
	65–74	75+	65+
Alzheimer's disease only	0.3	4.6	2.0
Multi-infarct dementia only	0.7	6.0	2.8
Mixed or unspecified dementia	1.0	1.2	1.3
Total	2.1	11.7	6.1

Appendix 1

DSM-III DIAGNOSTIC CRITERIA FOR PRIMARY DEGENERATIVE DEMENTIA (ALZHEIMER'S DISEASE)

A. Dementia (see Appendix 2).
B. Insidious onset with uniformly progressive deteriorating course.
C. Exclusion of all other specific causes of dementia by the history, physical examination, and laboratory tests.

Appendix 2

DSM-III DIAGNOSTIC CRITERIA FOR DEMENTIA

A. A loss of intellectual abilities of sufficient severity to interfere with social or occupational functioning.
B. Memory impairment.
C. At least one of the following:
   (1) Impairment of abstract thinking, as manifested by concrete interpretation of proverbs, inability to find similarities and differences between related words, difficulty in defining words and concepts, and other similar tests.
   (2) Impaired judgment.
   (3) Other disturbances of higher cortical function, such as *aphasia* (disorder of language due to brain dysfunction), *apraxia* (inability to carry out motor activities despite intact comprehension and motor function), *agnosia* (failure to recognize or identify objects despite intact sensory function), "constructional difficulty" (e.g., inability to copy three-dimensional figures, assemble blocks, or arrange sticks in specific designs).
   (4) Personality change, i.e., alteration or accentuation of premorbid traits.
D. State of consciousness not clouded (i.e., does not meet the criteria for delirium or intoxication, although these may be superimposed).
E. Either (1) or (2):
   (1) Evidence from the history, physical examination, or laboratory tests of a specific organic factor that is judged to be etiologically related to the disturbance.
   (2) In the absence of such evidence, an organic factor necessary for the development of the syndrome can be presumed if conditions other than organic mental disorders have been reasonably excluded and if the behavioral change represents cognitive impairment in a variety of areas.

Appendix 3

DSM-III DIAGNOSTIC CRITERIA FOR MULTI-INFARCT DEMENTIA

A. Dementia.
B. Stepwise deteriorating course (i.e., not uniformly progressive) with "patchy" distribution of deficit (i.e., affecting some functions, but not others) early in the course.
C. Focal neurological signs and symptoms (e.g., exaggeration of deep tendon reflexes, pseudobulbar palsy, gait abnormalities, weakness of an extremity, etc.).
D. Evidence from the history, physical examination, or laboratory tests of significant cerebrovascular disease that is judged to be etiologically related to the disturbance.

Appendix 4

MINI-MENTAL STATE EXAMINATION (FIELD SURVEY FORM)

Now I would like to ask you some questions to check your concentration and your memory. Most of them will be easy.

What is the . . .	*Record Answers*		Right	Error	Refusal: Can't Do	Refusal: Other Refusal
year?			1	2	6	7
season?	Winter	Spring	Summer	Fall	Can't Do	RF
	1	2	3	4	6	7
date?			1	2	6	7
day of the week?			1	2	6	7
month?			1	2	6	7
Can you tell me where we are right now? For instance, what state are we in?			1	2	6	7
What city are we in?			1	2	6	7

What are two main streets nearby?		1	2	6	7
What floor of the building are we on?		1	2	6	7
What is this address or what is the name of this place?		1	2	6	7
I am going to name three objects. After I have said them, I want you to repeat them. Remember what they are because I am going to ask you to name them again in a few minutes.	Apple:	1	2	6	7
	Table:	1	2	6	7
	Penny:	1	2	6	7
Please repeat the three items for me. "Apple" . . . "Table" . . . "Penny" . . . *Score first try. Repeat objects until all are learned.*					

Can you subtract 7 from 100, and then subtract 7 from the answer you get and keep subtracting 7 until I tell you to stop?

Record: __ (93) __ (86) __ (79) __ (72) __ (65)

Number of errors: 0 1 2 3 4 5

Count 1 error when difference between numbers is not 7.

RF: Can't do 6
Other refusal 7

Now I am going to spell a word forwards and I want you to spell it backwards. The word is WORLD, W-O-R-L-D. Spell "world" backwards.

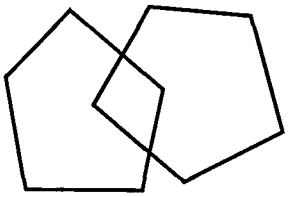
Print letter: _ _ _ _ _ _ _ _ _

Number of errors: 0 1 2 3 4 5

Repeat if necessary, but not after spelling starts.

RF: Can't do 6
Other RF 7

		Right	Error	Can't Do	Other RF
Now what were the three objects I asked you to remember?	Apple:	1	2	6	7
	Table:	1	2	6	7
	Penny:	1	2	6	7
Show wristwatch. What is this called?	Watch:	1	2	6	7
Show pencil. What is this called?	Pencil:	1	2	6	7
I'd like you to repeat a phrase after me: "No ifs, ands, or buts" *Allow only one trial.*		1	2	6	7
Read the words on this page and then do what it says. *Hand "close your eyes" sheet. Code 1 if respondent closes eyes.*		1	2	6	7
*Read full statement and **then** hand over the paper.* I'm going to give you a piece of paper. When I do, take the paper in your right hand, fold	Right hand:	1	2	6	7
	Folds:	1	2	6	7

the paper in half with both hands, and put the paper down on your lap.	In lap:	1	2	6	7
Write any complete sentence on that piece of paper for me. *Sentence should have a subject and a verb, and make sense. Spelling and grammar errors are okay.*		1	2	6	7
Here is a drawing. Please copy the drawing on the same paper. *Correct if the two five-sided figures intersect so that their juncture forms a four-sided figure and if all angles in the five-sided figures are preserved.*		1	2	6	7

References

1. McHugh PR: Dementia, *in* Beeson P, McDermott W, Wyngaarden J (eds): Cecil Textbook of Medicine, 15th ed. Philadelphia, W.B. Saunders, 1979, pp 660–663
2. Gurland B, Dean L, Cross P, et al: The epidemiology of depression and dementia in the elderly: the use of multiple indicators of these conditions, *in* Cole JO, Barrett JE (eds): Psychopathology in the Aged. New York, Raven Press, 1980, pp 37–62
3. Busse EW, Wang HS: Multiple factors contributing to dementia in old age, *in* Palmore E (ed): Normal Aging, Vol II. Durham, NC, Duke University Press, 1974, pp 151–160
4. Roth M, Hopkins B: Psychological test performance in patients over sixty. I: Senile psychosis and the affective disorders of old age. J Ment Sci 439–508, 1953
5. Folstein MF, Folstein SE, McHugh PR: "Mini-Mental State." A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res 12:189, 1975
6. Anthony JC, LeResche LR, VonKorff MR, et al: Limits of the 'Mini-Mental State' as a screening test for dementia and delirium among hospital patients. Psychol Med 12:397, 1982
7. Kramer M, German PS, Anthony JC, et al: Patterns of mental disorders among the elderly residents of eastern Baltimore. J Am Geriatr Soc 33:236, 1985
8. American Psychiatric Association: Diagnostic and Statistical Manual, 3rd ed. Washington, D.C., American Psychiatric Association, 1980
9. Folstein MF, Gruenberg EM, et al: Eastern Baltimore Mental Health Survey Clinical Reappraisal, Ch. 18, *in* Eaton WW, Kessler L (eds): Epidemiologic Field Methods in Psychiatry: The NIMH Epidemiologic Catchment Area Program. (in press)
10. Wolfson LI, Katzman R: The neurologic consultation at age 80, *in* Katzman R, Terry R (eds): The Neurology of Aging. Philadelphia, F. A. Davis, 1983, p 235
11. Kay DWK, Beamish P, Roth M: Old age mental disorders in Newcastle-upon-Tyne. Part I: A study of prevalence. Br J Psychiatry 110:146, 1964