"SELF-TITRATION"

A Study of Long-term Prescribing in a British National Health Service General Practice

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by

Gareth Lloyd
B.Sc. MB. Ch.B.(Liverpool) MRCOG London MRCGP London

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PREFACE

"The desire to take medicine is the chief thing that differentiates man from the lower animals" - Osler.

The aim of the work described in this thesis has been to observe the failure of compliance with long-term medical regimes of treatment by 467 patients in a National Health Service Practice in the United Kingdom. A new method of measuring failure of compliance is described and failure is related to other characteristics of the patients and to clinical intervention by the doctor. Throughout the period of observation the patients were unaware that compliance with medicinal treatment was being recorded.

At a time when there is increasing intent in the United Kingdom to conduct more medical care in the community than in hospital, it becomes significant to evaluate the reaction of patients to treatment in the community. The greater part of medicinal treatment in General Practice is self-administered by the patient. The patient becomes an active participant in the treatment and may frequently exercise sole control over the amount of treatment taken. Whilst recognising this to be important, it must be even more significant to know the way in which the patient exercises control. Rosen and Lidz in 1949 stated "The physician not infrequently finds himself in the frustrating situation of having his efforts thwarted more by the patient than by the disease process". (Rosen H. Lidz T. 1949)

Many acute illnesses are self-limiting and patients frequently discontinue therapeutic treatment at a time which falls short of the optimum duration (Davis M.S. 1967). On the other hand, patients with chronic illness may continue intermittent treatment for very long periods of time. In both these instances it is the action of the patient which ultimately determines the amount of treatment taken, even when treatment takes place in hospital (Gardener T. Cluff L.E. 1970).

The physician and his associates have a clear responsibility to encourage acceptance by the patient of what is believed to be optimal treatment (Editorial 1970 - Journal of American Medical Association). Paradoxically, the determination ofoptimal treatment may be dependent upon patient compliance during the course of clinical trials (Maddock R.K. 1967).

For the purpose of this thesis, observation has been confined to long-term illnesses and their treatment. Balint (Balint M. et.al. 1970) has defined long-term treatment to be of a duration of longer than six months.

The work of this thesis differs from previous reports in that all patients who are identified in terms of Balint's definition are included in the observation rather than patients identified by the nature of their illness or of the drug or medicine used.

Whilst previous observers claim to measure the amount of drugs a patient has taken, the work of this thesis is concerned with <u>THE MEASUREMENT OF THE AMOUNT OF MEDICINE REPRESENTED BY PRESCRIPTIONS WHICH HAVE NOT BEEN COLLECTED</u>.

Such measurement is an absolute measurement of the maximum amount of medicine which is known not to have been taken. The measurement is called "M.A.F." - (Maximum Absolute Failure). Comparisons are made between variations in this measurement and other factors relating to the patient.

There is evidence that the patient's perception of his or her illness influences compliance with medical treatment (Brophy J.J. 1969: Bolter M.B. 1969)

Many of the evaluations contained in the present thesis are intended to support the view that over long periods patients may exercise control of treatment in a manner which may be described as:-

"Self-Titration"

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ABBREVIATIONS

DOL	Duration on List
DOD	Duration of Diagnosis
A	Consultant Diagnosis
B	General Practitioner Diagnosis
DC	Diagnostic Code
M/S	Marital State
S.S.	Social Status
D.	Diagnosis
R	Prescription item
n	Sample size
m	Mean value of sample
s	Standard deviation of sample
P	Statistical probability
χ^2	Chi square

REVIEW OF THE LITERATURE

INTRODUCTION

METHODS OF ESTIMATING COMPLIANCE

REVIEW OF THE LITERATURE

Introduction

The literature reviewed in the preparation of this thesis was largely published in journals which appear in English and represent studies undertaken in Britain and the Americas. A few publications from Norway, Germany, Czechoslovakia and Poland were also read and appropriate material included in the review.

Though the present thesis is concerned with long-term prescribing, evidence relating to short-term treatment is included in the review because of the relevance of the methods used to determine compliance, and difficulties expressed in evaluating results. A broader view of the principles underlying the available methods of estimation has therefore been possible.

Studies from General Practice in the United Kingdom

Remarkably few observations have been made of compliance with treatment by General Practitioners in the United Kingdom.

Notable exceptions are the reports of Porter (1969) and Gatley (1968). Both these workers have tested compliance by means of pill counts and Porter has also used riboflavin-marked drugs in urine excretion tests.

Porter's work is widely quoted and seems to be the only enquiry in depth of the acceptance of treatment in General Practice.

The morbidity records and the Age/Sex Register maintained by the author are facilities made available to General Practitioners following research in General Practice. Appropriate references are made in the text. The Record Card used for this thesis is derived from the Age/Sex Record Card of the Royal College of General Practitioners.

Methods of Estimating Compliance

Introduction

Three common methods of measuring compliance with medical treatment regimes are reviewed. These are the "questionnaire method"; the "pill counting method"; and the "urine testing method".

Each has its advantages and disadvantages and these are appropriately indicated in the review.

Particular attention has been given to the pill counting method as it is a projection of this which provides a basic measurement contained in the work of the thesis.

(1) Questionnaire Method

The use of questionnaires or interviews with patients to estimate compliance with medical regimes of treatment has not been as commonly adopted as the pill counting or urine testing methods.

A variety of questionnaires have been used to determine the compliance of patients. Questionnaires have been administered to patients or relatives of patients. The measurement is entirely subjective.

Table 1 summarises the reports of evaluations made using the questionnaire method.

Leon Gordis (1969) has shown that the use of the interview technique produces evidence of compliance which is highly inaccurate when compared with results obtained by urine testing. He found that 75% of the parents of non-compliers told the interviewer at home that their children generally took penicillin tablets at least once a day.

Other studies have shown a discrepancy between compliance as measured by pill count or urine testing as against compliance measured by questionnaire. Chaves (1960) reported that 22% of patients who were on P.A.S. therapy and were considered compliers by questionnaire, were found not to have the drug in the urine. Bergman and Werner (1963) reported that 83% of families verbally reported that their children completed a ten-day course of penicillin, yet on pill count estimation it was apparent that 82% had stopped by the ninth day. Willcox (1965) found that 31% of a group of patients reported taking tranquillisers, when urine testing indicated they did not. In a study of a neurotic out-patient population, Park and Lipman (1964) observed that only 15% of all patients reported drug deviations, whereas a pill count showed deviation in 51%. These doctors, however, suggest that absolute rejection of the questionnaire method may be unwarranted. They showed that when the pill count showed major deviation, patients were more likely to report deviation, than when pill count indicated only minor deviation. Thus, although Park and Lipman recommend the

TABLE 1

QUESTIONNAIRE

Author	Year	No. of patients	Sex of Patients	Duration of Observation	Location of Observation	Compliance reported as percentage	Drug	Notes
MOHLER D.N.et.al	1955	245	M & F	7 days	Gen. Pract. U.S.A.	66% (R)	Penicillin	
FEINSTEIN A.R.et.al	1959	113	M & F	12 mths	Hosp. O.P.	73% (R)	Penicillin	50% compliance found by pill count
FEINSTEIN A.R.et.al	1959	126	M & F	12 mths	Hosp. O.P.	66% (R)	Sulphadiazine	33% compliance found by pill count
PITMAN E.R.et.al	1959	61	M & F	Single report	Hosp. O.P.	47% (C)	P.A.S.	41% compliance on urine test
PARKES C.M.et.al	1962	100	M	12 mths	Hosp. and Gen. Pract.	50% (C)	Tranquillisers	Definition of compliance not clear
BERGMAN A.B.et.al	1963	59	M & F	9 days	Paediatric clinic	83% (R)	Penicillin	Also used pill count and urine test but did not make direct comparisons
PRESTON J.F.et.al	1964	25	M	Single report	Hosp.	96% (R)	P.A.S.	
PARK L.C.et.al	1964	36	M & F	-	Psychiatric O.P.	85% (R)	Imipramine	Comparison with 49% result on pill count. Similar results with placebo
LEISTYNA J.A.et.al	1966	162	M & F	10 days	Paediatric clinic	91% (R)	Penicillin	89% compliance by medicine count
WATKINS) J.D.et.al)) ")	1966	(115) ( ) (47) ( )	( ) ( ) (M & F) ( )	( ) ( ) (-) ( )	Patient's home	65% (R) 77% (R)	Insulin Oral Hypoglycaemic	(Presence of (observers in the (home may have (improved compliance

continued/

Author	Year	No. of patients	Sex of patients	Duration of Observation	Location of Observation	* Compliance reported as percentage	Drug	Notes
NEELEY E.et.al	1968	236	M & F	Single patient report	Community	61% (R)	Various	
GIBSON I.I.J.M. et.al	1968	175	M & F	Single visit	Patient's home	79% (R)	Various	Geriatric patients.
GORDIS L.et.al	1969	103	M & F	6 mths	Hosp. O.P.	91% (R)	Penicillin	20-35% compliance by urine tests

TOTAL PATIENTS = 1,603

MEAN REPORTED COMPLIANCE = 74%

RANGE = 47% (PITMAN) to 96% (PRESTON)

R = COMPLIANCE REPORTED AS PERCENT BY AUTHOR

C = COMPLIANCE CALCULATED AS PERCENT FROM FIGURES REPORTED BY AUTHOR

CLIENTE J.C.	1969	30	M & F	Single Interview	Patient's home	50% (C) at least half	79 varieties	Not possible to calculate a comparable percentage

* = THE MEAN OF MULTIPLE OBSERVATION OR THE APPARENT COMPLIANCE ASSUMING RANDOM TESTS TO BE INDICATIVE OF CONSISTENT PATIENT BEHAVIOUR

use of pill counts, they note that verbal reports will provide accurate information in a "good percentage" of those patients for whom deviation information is most critical - i.e. major deviators.

Advantages of Questionnaire Method

The method is applicable to the measurement of compliance in both short and long-term treatment and is independent of the type of drug taken or the nature of the illness.

Disadvantages of Questionnaire Method

The estimation is entirely subjective.

(2) Drug Excretion Tests

The testing of urine for the presence of a drug, the by-product of a drug or a tracer element attached to a drug, has had wide application.

This method has considerable objectivity and has proved useful in studies of individual or very narrowly limited varieties of drug.

A summary of studies which have used drug excretion tests is shown in Table 2 . This section of the review is included because the results might be expected to be more reliable in view of the objectivity of the test. This objectivity may, however, be modified by a number of factors:-

a) Frequency of Performance of Test

Wynn-Williams (1958) points out that - "Unless a patient is completely regular or fails entirely to

TABLE 2

URINE TESTING

Author	Year	No. of patients	Sex of patients	Duration of Observation	Location of Observation	Compliance reported as percentage	Drug	Notes
SIMPSON J.McD.	1956	28	M & F	N/S	Hosp. O.P.	76% (R)	P.A.S.	Hypochlorate test
DIXON W.M.et.al	1957	151	M & F	Single test	Hosp. O.P.	50% (R)	P.A.S.	
LEGGATT P.O.	1957	50	M	Single test	Hosp. O.P.	78% (R)	P.A.S.	
BRIETE M.J.	1958	29	Not stated	Single test	Hosp. In.P.	90% (R)	P.A.S.	False positive tests found in control groups
		76	Not stated	Single test	Hosp. O.P.	45.5%(R)	P.A.S.	
WYNN WILLIAMS N.et.al	1958	153	M & F	12 mths	Hosp. O.P.	51% (R)	P.A.S.	Multiple urine tests. Mean no. of urine tests per patient when all tests positive = 5. Mean no. of urine tests per patient when one or more negative = 6.8
CHAVES A.D.	1959	2,672	M & F	Single test	24 Hosp. clinics	60.5%(R)	P.A.S.	Range of compliance between clinics = 46% - 75%
VELU S.et.al	1960	126	M & F	2 years	Hosp. O.P.	79% (R)	Isoniazid	
					Patient's home	77% (R)	Isoniazid	

continued/

Author	Year	No. of patients	Sex of patients	Duration of Observation	Location of Observation	* Compliance reported as percentage	Drug	Notes
LUNTZ. G.R.W.N.	1960	420 285 444	M F M & F	8 weeks 8 weeks 1 week	Hosp. O.P. Hosp. O.P. Hosp. In.P.	70% (R) 61% (R) 98% (R)	P.A.S.) P.A.S.) P.A.S.	Found results affected by ingestion of aspirin by patients
JOYCE C.R.B.	1962	67	F	4 mths	Hosp. O.P.	69% (R) 54% (R)	Butazolidine) Placebo)	Phenol red tracer used
BERRY D.et.al	1962	92	M & F	60 days	Patient's home	89% (R)	I.N.H.	30% failure of sample collection
BERGMAN A.B.et.al	1963	59	M & F	9 days	Paediatric clinic	40% (R)) Day 3) 31% (R)) Day 6) 8% (R)) Day 9)	Penicillin	
PRESTON D.F.et.al	1964	25	M	Single test	Hospital	72% (R)	P.A.S.	
WILLCOX D.R.C. et.al	1965	125	M & F	N/S	Psychiatric O.P.	52% (R)	Tranquillisers	Chromatographic test for amphetamine-like substances in urine
MADDOCK R.K.	1967	50 33	M & F M & F	6 mths 6 mths	Hosp. O.P. Hosp. O.P.	70% (R) 58% (R)	I.N.H. P.A.S.	
CHARNEY E.et.al	1967	459	M & F	5 days	Patient's home	56% (R)	Penicillin	Urine culture test
GORDIS L.et.al	1969	136	M & F	N/S	Schools	64% (C)	Penicillin	Urine culture test

continued/

Author	Year	No. of patients	Sex of patients	Duration of Observation	Location of Observation	Compliance reported as percentage	Drug	Notes
JOHNSTON R.N.et.al	1969	79	M & F	4 mths	Hosp. O.P.	80% (R)	Tetracycline	
PORTER A.M.W.	1969	19	M & F	2 years	Gen. Pract. U.K.	84% (C)	Imipramine	Riboflavin marker. Study restricted by practical difficulties of marking drug

TOTAL PATIENTS = 5,578

MEAN REPORTED COMPLIANCE = 63%

RANGE = 8% (BERGMAN) to 98% (LUNTZ)

R = RESULTS REPORTED AS PERCENT BY AUTHOR

C = RESULTS CALCULATED AS PERCENT FROM FIGURES REPORTED BY AUTHOR

* = THE MEAN OF MULTIPLE OBSERVATION OR THE APPARENT COMPLIANCE ASSUMING RANDOM TESTS TO BE INDICATIVE OF CONSISTENT PATIENT BEHAVIOUR

take the drugs, the recording of a negative test is to some extent a matter of chance, the day of the test coinciding with omission of the drug. This is shown by a variation of from 8% to 39% in the number of negative tests when they were analysed in fortnightly periods".

Dixon (1957) defends results obtained by estimation of a single urine test - "It is reasonable to assume that if a patient is unreliable once he is likely to be so again, and cannot be trusted to follow instructions meticulously. This is particularly so if the patients with negative tests profess to be regular consumers. Furthermore, it was felt that the patients would very soon guess the purpose of the test if we persisted in our investigations".

Maddock (1967) found that 3 patients who had repeated positive urine tests for Isoniazid had collected less than 60% of their prescribed medicines from the pharmacy.

When multiple urine tests have been examined, different criteria of compliance have been used.

Morrow and Rabin (1958) considered a patient to be compliant if half of the tests were positive, while Wynn-Williams (1958) on the other hand, required all but one test to be positive.

Differences in interpretation of multiple urine tests emphasise the limitations of the test in terms of absolute evaluation and also makes comparisons of studies difficult.

Willcox (1965) considers a completely negative chromatogram of chlorpromazine in urine to be "an absolute indication of failure" and observed that by such standards the failure rate is 33%. A more liberal interpretation of the chromatogram permits identification of a further 26% possible failure.

When an investigation is committed to evaluating urine samples, Berry (1962) emphasises a need for persistence, and this - "resulted in specimens being obtained twice in a tavern and once in a laundromat, at an all-day church meeting and on a river bank that was a patient's favourite fishing spot".

Specimens collected at out-patient clinics might be expected to show a higher positive rate than specimens collected at unannounced home visits. Morrow and Rabin (1958) found this to be true, whilst Maddock (1967) found that there was no difference.

The wide variation in compliance as determined by various observers using urine tests suggests a need for a standard frequency of testing which could allow inter-investigation comparisons.

b) <u>False Positive Tests</u>

False positive tests have been reported. Charney (1967) reported a small portion of false positive tests (positive urine tests though penicillin not taken). Joyce, (Joyce C.R.B. 1962) observed a

false positive test of a phenol red marker. H.D. Ireland (1960) reported that the urine of 3 of a control group of 15 patients who were not taking P.A.S. showed a positive reaction to the phenistix (Ferric paper strip) test.

c) Reliability of Methods of Drug Estimation

The estimation of the excretion of penicillin in urine presents problems. Grove and Randall (1958) state that as little as 0.005 units of penicillin can be detected in urine. Bergman (1963) notes that penicillin was detected in the urine 16 hours after the last dose. Charney (1967) estimated the standardisation of culture techniques to estimate penicillin in urine permitted the minimum of only 18 hours to elapse before the patient could be described as "a defaulter".

Campbell (1970) concluded from the examination of 400 urine specimens for metabolites of larodopa, that the chemical techniques involved were not sufficiently sensitive to provide an accuracy of better than 80%.

Further difficulties are encountered when renal function is impaired. Kunin (1966) has observed that of 35 types of anti-bacterial drug, the effect of renal function on the excretion of the drug is not known for ten drugs. Knowledge of drug metabolism in patients who have impaired renal

function is not complete (Editorial - Drug and Therapeutic Bulletin 1969).

Many drugs cannot be easily measured in urine. Tracer substances, such as riboflavin (Hobby 1959), phenol red (Joyce 1962), have been used to overcome this difficulty. This technique has the disadvantage that the excretion of the tracer does not always coincide with the excretion of the drug. Silberstein and Blackman (1966) have drawn attention to the psychological dangers of tracers which produce visible changes in urine colour.

Joyce (1962) has summarised some of the disadvantages inherent in the use of tracer substances - "The choice of a marker to check the consumption of pills is extremely difficult. Such a substance must be devoid of pharmacological and psychological action (e.g. it should not run the risk even of changing the appearance of the urine - that no patient complained of this or commended upon it is not evidence that it did not occur in the present case); and it must be easily detectable at low concentration in excretions (preferably urine) following administration of small amounts. Its ideal rate of excretion is almost impossible to specify if, as was necessary in the present case, the urine is tested only once in each treatment period, and always at the end: for it must be so rapidly excreted that defaulting can be detected, yet so slowly that its absence signifies default with certainty".

The chemical estimation of all the drugs included in the present study was not feasible. Observations contained in this thesis have included a number of patients with chronic heart disease and altered renal function, and in whom urine tests could present significant practical difficulties, particularly of interpretation.

The variety of drugs taken by the patients observed during the study is large and the attachment of a tracer substance to all such drugs presents prohibitive problems.

Advantages of Urine Tests

The test has objectivity and may be used in the measurement of compliance during short or long-term treatment.

Disadvantages of Urine Tests

a) Patients may become aware of the observation and modify their behaviour relative to drug intake.

b) Single or infrequent tests during long-term treatment may give rise to misleading results.

c) Use of the test is restricted to single drug estimation or observations of a narrow range of drugs.

Because of the wide variety of drugs included in the observation for this thesis the use of the test is excluded. The observations of Porter (1969) show that the urine test has very significant limitations when it is used to validate estimates of compliance obtained by means of other testing methods.

(3) Pill Counting

Corrigan and Strauss (Corrigan J.C. StraussM.B. 1936) described the method of issuing a known number of tablets and asking the patient to return the container at the end of a pre-determined interval. The number of tablets remaining in the container were counted. This is probably the first description of a method which has come to be popularly described as "pill counting" in the United States, and "tablet counting" in the United Kingdom. Porter (1969) describes the use of this method in General Practice in the United Kingdom. It is an extension of this method which is explored in the work of this thesis.

Whilst previous observers have measured the content of a single or multiple prescription, the method used in the present study has been a count of the prescriptions themselves over a period of one year.

As patients are registered with a particular doctor in General Practice in the United Kingdom, the source of prescriptions remains constant, and meaningful measurement can be made. The pill counting method as described by others has the advantages of simplicity and considerable objectivity and has had wide application.

Use of Counting Test for Various Drugs

The pill counting test has been applied to a variety of medications, among which are penicillin (Feinstein 1959: Arnhold 1970: Bergman 1963), thyroxin (Porter 1969), antacids (Roth H.P. 1970), chlorodiazipoxide (Rickels K. 1970) meprobamate (Lipman R.S. 1965), predinsolone (Nugent et.al. 1965) imipramine (Park L. et.al. 1964), and iron in pregnancy (Porter 1969)

The method has also been used to measure compliance among groups of patients taking a wide variety of drugs. (Porter 1969: Arnhold 1970: Gatley M.S. 1968: Cliente J.C. 1969). Table 3 summarises pill counting methods.

A number of studies using the pill count method have included a comparison of the compliance with drug treatment and placebo treatment. Park and Lipman (1964) found 49% compliance with imipramine therapy and 85% compliance with a placebo. Rickels (1970) found 50% compliance with chlordiazipoxide and placebo. In another study, Lipman (1965) found 58% compliance with meprobamate and 51% compliance with placebo. It is suggested that the undesired effects of drugs can cause a discrepancy.

The method therefore has wide applications in terms of the nature of the medicine being observed, though Roth et.al. (1960) describe the difficulties encountered with liquid antacid medicines in so far as allowance has to be made for some medicines adhering to the bottle.

Reported Disadvantages of the Pill Counting Method

a) Failure of return visits by patients.

The pill count method is dependent upon a return attendance by the patient. A number of studies have recorded difficulty in achieving this objective. The response of patients who have failed to return is usually excluded from the calculation of compliance. In 5 studies, the degree of exclusion is reported (Arnhold R.G. 1970: Porter 1969: Gatley 1968: Bergman 1963: Rickels 1970) and varies between 13.5% (Gatley 1968) and 50% (Rickels 1970), with a mean of 30%

TABLE 3

PILL COUNTING

Author	Year	No. of patients	Sex of patients	Duration of Observation	Location of Observation	Compliance reported as percentage *	Drug	Notes
FEINSTEIN A.R.et.al	1959	113 126	M & F M & F	1 year 1 year	Hosp. O.P. Hosp. O.P.	55% (R) 44% (R)	Penicillin Sulphadiazine	
ROTH H.P.et.al	1959	160	N/S	6 mths	Hosp. In.P.	42% (R) ***	Antacid mixture	Bottle count. Patient believed to be unaware of observation
IRELAND H.D.	1960	246	M & F	3 years	Hosp. O.P.	43% (R)	P.A.S.	Prescription count. Result represents failure to take at least half of treatment
VELU S.et.al	1960	126	M & F	2 years	Hosp. O.P. Patient's home	80% (R) 80% (R)	Isoniazid Isoniazid	
BERGMAN A.B.et.al	1963	59	M & F	9 days	Paediatric clinic	44% (R) day 3 29% (R) day 6 18% (R) day 9	Penicillin	
LIPMAN R.S.et al	1965	125 129	M & F	6 mths	Hosp. O.P.	58% (C) 51% (C)	Meprobamate Placebo	
GATLEY M.S.	1968	111	M & F	1-4 wks	Gen. Pract. U.K.	40% (C)	Various tablets and capsules	

continued/

Author	Year	No. of patients	Sex of patients	Duration of Observation	Location of Observation	Compliance reported as percentage	Drug	Notes
CLIENTE J.C.	1969	30	M	28 days	Patient's home	75% (R)	Wide range of various drugs	
PORTER A.M.W.	1969	58	M & F	mean 326 days	Gen. Pract. U.K.	84% (R)	Various - including Digoxin and Thyroxin	Result represents a discrepancy index
LIBON L.S.et.al	1970	20	M & F	2 weeks	Hosp. In.P.	75% (R)	Placebo (glucose)	
RICKELS K.et.al	1970	198	M & F	4 weeks	Patient's home	81% (R)	Chlordiazepox-ide	
ARNHOLD R.G.et.al	1970	104	M & F	Several weeks	Gen. Pract. U.S.A.	75% (R)	Antibiotics - Various	
ROTH H.P.et.al	1970	160	M & F	2 years	Hosp. O.P.	54% (R)	Liquid antacid	Poor correlation found between pill count and blood test for bromide tracer

TOTAL PATIENTS = 1,765

MEAN REPORTED COMPLIANCE = 58%

RANGE = 16% (BERGMAN) to 84% (PORTER)

R = COMPLIANCE REPORTED AS PERCENT BY AUTHOR

C = COMPLIANCE CALCULATED AS PERCENT FROM FIGURES REPORTED BY AUTHOR

* = THE MEAN OF MULTIPLE OBSERVATION OR THE APPARENT COMPLIANCE ASSUMING RANDOM TESTS TO BE INDICATIVE OF CONSISTENT PATIENT BEHAVIOUR.

*** (IRELAND) = OMITTED FROM CALCULATION OF MEAN

Author	Year	No. of patients	Sex of patients	Duration of Observation	Location of Observation	Compliance reported as percentage	Drug	Notes
NUGENT C.A.	1965	28	M & F	279 days maximum	Hosp. O.P.	? 75%	Prednisolone	Not possible to calculate percentage compliance accurately

PILL COUNT NOT INCLUDED IN MAIN TABLE BECAUSE OF DIFFICULTY IN DETERMINING COMPLIANCE AS A PERCENTAGE.

Even when patients do return, a proportion failed to bring their unused medication with them. Rickels (1970) observed that 23% of patients failed in this respect. Lipman (1965) reported 25% failure and Park (1964) 30%. In an investigation of compliance with treatment by children, Arnhold (1970) uses the technique of the unannounced home visit. Of 150 patients visited, 46 monthers were not at home and Arnhold emphasises that the compliance of "working mothers may be under-represented".

Patients who do return to the surgery or clinic may be more representative of a compliant group and results of observations of compliance which include only such patients have questionable reliability.

b) Awareness of Observation by Patient

One of the problems presented by the pill count method is that the patient might become aware of being observed. Rickels (1970) claims that patients "Accept directions to return unused medication without question". Gatley (1968) in a study in General Practice, states - "A re-appointment was arranged immediately after the expected termination of the course and patients were requested to bring any remaining tablets in the container in which they were dispensed. To avoid arousing suspicion, no explanation was given for this request unless the patients asked. The few who enquired appeared to accept the explanation that a check was being made on the containers".

Jenkins (1954) and Porter (1969) on the other hand, consider subterfuge explanation to be necessary.

Roth, Herbert, and Bartholomew (1962) ascribe other difficulties to the method. Bottles or containers may be mislaid. There may be a need to collect and deliver bottles from the home. There is a risk of patients giving their medicines to others.

c) Variations in Criteria of Assessing Results of Pill Count

Variations in the criteria adopted by different observers to determine the compliance makes a comparative analysis of results difficult. Some observers (Jenkins B.W. 1954: Lipman R.S. et.al. 1965: Cliente J.C. 1969: Gatley M.S. 1968: Bergman A.B. 1963) have used a single count to determine compliance; others have used multiple counts (Nugent C.A. et.al 1965: Arnhold R.G. et.al. 1970). The variations in the criteria used to determine compliance is indicated by the following examples:-

Gatley M.S. (1968)

"The number of tablets taken was worked out as a percentage of the number estimated to complete the course after allowing for any delay in starting".

Arnhold R.G. (1970)

"To assess compliance we undertook to measure the quantity of dispensed medications which remained in the container".

Porter A.M.W. (1969)

"The number of tablets actually taken - as indicated by requests for prescriptions - divided by the number of tablets which should have been taken by a wholly compliant patient. The ratio will be below unity in a defaulting patient and more than unity if the patient exceeds the recommended dose".

Roth H.P. Berger D.G. (1959)

"The antacid was kept on the patient's bedside table so that the nurse could replace each empty bottle. The empty bottles were sent to the pharmacy where one of the investigators identified each bottle by the patient's name, and counted them. An accurate record of the amount of A.M.T. taken by each patient was thus obtained".

Nugent C.A. (1965)

"At each monthly visit, the patient was given bottles containing at least 240 tablets more than the number needed if the instructions were followed. The patients were told to return all unused tablets on each visit. At that time the tablets were counted and the number taken since the preceding visit was calculated. The dosage of corticosteroid reported as having been taken is the amount estimated by counting the tablets rather than the amount prescribed".

The differences in the computations reveal a sense of uncertainty about the validity of the pill count.

A significant deviation from the various pill counting methods indicated above has been made by Ireland (1960). This author introduces the concept of counting the number of prescriptions issued rather than the component "pills" or "tablets" - "Since these patients were all given a one-month supply of the drug on discharge, the first month of post-hospital treatment is omitted from the following charts. Those who returned on three occasions for a one-month supply over a six-month period were considered to be taking 50 of the prescribed amount; a two-month supply over a six-month period was considered to represent 33% etc."

Regrettably, Ireland proceeds to represent his results in terms of the treatment which is assumed to have been taken. The converse - i.e. - the treatment which could not have been taken, is free of assumption, and is a more valid absolute measure.

Fallacy of the Pill Count Method

The most significant fallacy of the pill count method is contained in Porter's statement "The compliance of patients on long-term treatment can be readily assessed by determining the compliance ratio. This is defined as the number of tablets actually taken - as indicated by requests for prescriptions - divided by the number of tablets which should have been taken by the wholly compliant patient" (Porter 1969). This statement implies a correlation between tablets taken and prescriptions collected. This illusion was surely uncovered by the observations of Nicholson on the discovery of unwanted drugs in private homes (Nicholson W.A. 1967). Nicholson was able to amass a total of 43,554 tablets and capsules from not more than 500 homes in West Hartlepool.

From the review of the literature it is clear that this difficulty in the interpretation of the pill count is recognised.

Roth H.P. (1970) reports - "The degree of correspondence between the bottle count and drug-tracer measure of drug intake ($r = 0.80$) suggests that for most patients a bottle count provided a satisfactory indication of adherence to a medical regime. However, the comparison between the two methods also suggested that there are limitations in the accuracy of the bottle count as a measure of drug consumption".

Cliente J.C. (1969) reports - "It should be noted that the number of errors are not errors per prescription order at a specific point in time since an error of omission one day balanced by an extra dose the next day would result in no recorded error if sampled at the end of day two".

Johnson R.N. (1969) reports - "Though the number of tablets remaining was checked in front of each patient at every visit, this was not regarded as a completely reliable estimate of drug acceptance".

The difficulty is overcome when the amount of medication which could not have been taken is used as the absolute measurement. This measure of the failure of compliance permits comparisons between patients and groups of patients and is the basic measurement for the work of this thesis.

Advantages of the Pill Counting Method

a) The method is simple and independent of chemical tests.

b) It is largely subjective

c) It may be applied over a wide range of drugs or illness

d) The test may be used to observe both short and long-term treatment.

Disadvantages of the Pill Counting Method

a) The patient may become aware of observation and modify his or her behaviour.

b) Failure of the patient to return to surgery of clinic introduces a significant bias.

c) Failure to return containers results in a diminution of the sample being observed.

Other Methods of Evaluating Compliance

A novel method of measuring compliance has been described by Moulding (1970) - "The medication monitor is a calendar-marked medication dispenser that includes radioactive material and photographic film to record the regularity with which medication packets are removed".

More recently, Mary Oakes (1973) has described the estimation of the serum level of four antibiotics as a measure of compliance. A summary of other methods is shown in Table 4.

TABLE 4

OTHER METHODS OF ESTIMATING COMPLIANCE

Author	Year	No. of patients	Sex of patients	Duration of Observation	Location of Observation	Compliance reported as percentage	Drug	Method
DAVIS M.S.	1968	154	M & F	Single Interview	Hosp. O.P.	63%	Wide range of variety	Composite index based on patient report, doctor's perception and record of drug dispensed.
MOULDING T.	1970	122	M & F	N/S	Hosp. O.P.	69%	Antitubercular drugs	"Medication monitor"- A calendar marked dispenser that includes radioactive material and a photographic film to record regularity.
OAKES M. et.al	1973	50	M & F	9 days	Gen. Prac. U.K.	86%	Antibiotics	Estimation of blood levels. Reliance on a single test does not give a good measure of compliance

F.B. Gibberd (1970) has shown that estimation of blood levels of phenytoin can be used to monitor compliance. A lower mean level of the drug (15.7 mg/mil) was found in an out-patient group as against a mean level of 28 mg/mil in an in-patient group.

In 1972 Baylis suggests "now that plasma digoxin levels can be measured relatively easily, their estimation should become part of clinical practice".

Variations in the results of estimates of blood levels of some drugs have been attributed to genetic differences in acetylation rates (D.A. Price Evans 1968) and concommitant therapy with other drugs (W. Hanmer et.al. 1967).

The use of blood level estimations is likely to have increasing significance as a measure of compliance. However, like urine tests, the method is likely to be useful for evaluation of single drugs or narrow ranges of differing drugs.

REVIEW OF THE LITERATURE

FACTORS AFFECTING COMPLIANCE

Factors Affecting Compliance

A number of studies of compliance with medical regimes of treatment have sought to determine a relationship between compliance and other characteristics of the patient.

The observed relationships described in the literature fall into one of two main categories:-

Demographic variables, including sex, age, social status, marital status, religion, race and education in one group.

The second group contains measurements of a less direct character and include - the doctor/patient relationship, the patient's perception of his illness, socio-psychological variables, and the duration of illness.

Reference is made to studies relating to all these factors in the following section of the review of the literature.

Sex

A few investigators have reported that women were more likely to discontinue anti-tuberculous drugs than men (Dixon 1957: Morrow and Rabin 1958: Wynn-Williams 1958). Other observers have found no significant relationship between sex and compliance (Maddock R.K. 1967: Willcox D.R.C. 1965: Charney E. 1967: Neeley E. 1968: Watkins J.D. 1966: Macdonald M.E. 1963: Porter A.M.W. 1969).

Age

Consideration of age was included in the present study because the relatively large number of patients, both male and female, would permit a reasonable comparison.

Doris Schwartz in the U.S.A. (Schwartz D: Wang M: Zeitz L: Goss M.E.W. 1962) and (Schwartz D. 1965) has demonstrated the difficulty which the elderly encounter in complying with medical regimes. Her report of 1965, though based on the questionnaire, illustrates graphically the confusion and memory problems which the elderly encounter. The following extracts are illustrative:-

"Even when I understand, it isn't easy to remember to take all these pills several times a day, but if I change my thinking from "twice a day" to "breakfast and lunch", and put them on the salt and pepper tray, and my wife or I move them on and off the table with each setting, and if the bottle is big enough or flagged with a bright sticker, I am likely to take them".

"He tells you to take this one that way and that one another way, and all the time you are looking at the prescriptions and you wonder what colour it is. Is it going to be liquid or a pill? When I get all the different medicines, will I know which one he means?".

Mohler (1955) in a study of penicillin therapy for streptacoccal disease, observed that the younger patients were more likely to comply with treatment (67.7% compliance for children against 50% for adults). Bergman and Werner (1963) and Morrow and Rabin (1958) reported that younger patients were less likely to follow their medical regimes than older patients.

In a number of studies, the conclusion is reached that age is probably not significant in relation to compliance (Maddock 1967: Willcox 1965: Charney 1967: Neeley 1968: Roth and

Berger 1970: Prickman 1958: Macdonald 1963: Davis 1967). The patients included in the observation for this thesis were ranged over a wide age group and many were over the accepted geriatric age of 65.

Religion

Morrow and Rabin (1958) and Davis (1967) reported no association between religion and compliance. Observation by others relating to religion was not encountered in the literature.

Race

A number of published reports contain attempts to relate race with compliance (Morrow and Rabin 1958: Neeley et.al 1968: Watkins et.al 1966: Patrick M.L. 1963: and Macdonald M.E. et.al 1963). A relationship has not been established by any of these authors.

Education

Morrow and Rabin (1958) reported that an increased amount of education was associated with better compliance. Davis (1963) reported finding the converse.

A number of observers (Maddock 1967; Charney 1967: Neeley 1968: Heinzelmann 1962) found no association between education and compliance.

Marital Status

The report of Morrow and Rabin (1958) is the only one encountered in the literature which suggests a relationship between being married and a higher compliance rate, as

compared with the separated and divorced. No evidence has been found which shows a difference in compliance between married patients and those who have no marital experience.

Social Status

Leistyna (1966) found that the parents of children in middle income families appeared to encourage better compliance with penicillin therapy for tonsillitis, than other groups. The interpretation of this finding is difficult because Leistyna issued a duplicated instruction sheet concerning treatment to the parents. The instructions contained threats outlining the possible outcome of failure to take medication such as the development of scarlet fever, rheumatic fever, and nephritis. It is impossible to determine from this study whether social status is related to direct compliance or to compliance conditioned by the threat. Charney (1967) found that children of equivalent social status to those described by Leistyna had a poorer compliance with penicillin therapy than children in other social groups.

The experience of most reporters is that there is no correlation between social status and compliance (Maddock 1967: Morrow and Rabin 1958: Ireland 1954: Mohler 1955: Neeley 1968: Macdonald 1963: Elling 1960: Heinzelmann 1962: Gray R.M.et.al 1966: Porter 1969).

Numbers of Drug Doses per Day

Gatley (1968) found that there was a "clear relationship" between compliance and the number of doses in the day. With one daily dose 67% of patients took tablets as prescribed. With twice daily doses compliance was 50%, and with four doses a day 22%.

Jenkins (1954) concluded that more medication doses were omitted when four doses per day were prescribed than when fewer than four doses were prescribed.

Both these studies from General Practice in the United Kingdom were reports resulting from observations of relatively small numbers of patients (Jenkins - 20 : Gatley - 86).

Consideration of drug dose per day has been made in the work of this thesis.

Language

Katzoff J (1969) has been sufficiently impressed by language barriers in multi-racial communities as to stimulate him to use an electronic data processing system to create a universally translatable code for detailing prescribing instructions. The dispensary pharmacist could use the code to write instructions for the patient in any language.

Nature of Drug Administration

Feinstein (1959) gave clear indication that injections administered by medical staff are more effective than self-administered oral treatment because of variation in patient compliance.

Patient Interaction

Kissin B (1968) reports that treatment of alcoholics in groups induces the development of a "concensus of opinion" which may influence compliance with treatment. It is suggested that patient attitudes to treatment may arise "spontaneously" through interaction with other patients.

Duration of Illness

There are some indications in the literature that the duration of illness may influence compliance and Luntz (1960), in a five-year study of tubercular patients, found that with the passage of time there was a progressive increase in non-compliance rates and that at the end of the five years, excretion tests for P.A.S. were negative. Bergman and Werner (1963) observed that 92% of patients under treatment with oral penicillin for streptacoccal infections were found to have discontinued their treatment by the ninth and last day of treatment. On the other hand, Gordis, (1969) and his colleagues found no significant change in compliance over time for a group of children taking prophylactic penicillin for rheumatic fever. Bonner reported that in 1969, 32% of ante-natal patients were not taking their iron tablets at the end of two months and that these patients became less co-operative as pregnancy advanced. Porter (1969) observed that of 9 variables which might affect the compliance ratio, the duration of observation was the most significant in ante-natal patients taking iron tablets. On the other hand, Porter observed that in 58 patients on long-term treatment (mean length of 326 days) there was no correlation between compliance ratio and duration of treatment.

Previous observations have been concerned with a relationship between compliance and prospective illness. For the purpose of this thesis, retrospective evaluation of the duration of illness has been made and correlation sought with the index of measurement (M.A.F.)

Attitude of the Patient

A number of studies have drawn attention to the relationship between patient attitude or behaviour, and compliance with therapeutic treatment.

Charney (1967) reported that compliance was significantly greater (70%) when mothers estimated that their children, who were being treated for otitis media, were moderately to severely ill, than when they thought their children were not ill or only mildly ill (30%).

Greenlick (1968), in a study of drug utilisation under a drug pre-payment plan, found that patients judge which diseases are the most threatening and serious, and re-define their drug needs on the basis of this evaluation.

In terms of behaviour, James T. Brophy, in 1969, identified three factors which are significant:-

1. Psychological
2. Embarrassment
3. Economic

The psychological barrier revolves around a denial of illness and is described to be reflected in such terms as "I feel good so why should I take medication?" or "If I continue to take medicine it proves that I am still sick"

Embarrassment may be associated with a need to take drugs at a place of work or in a community setting.

Brophy emphasises that only the person himself and his family, who pay the monthly pharmacy bill, realise what a financial burden it is. Nor infrequently it comes down

to a choice between a new pair of shoes for a youngster or a month's supply of medication. The patient will often consider the shoes more important.

Sir Derek Dunlop has drawn attention to the correlation between the total prescriptions dispensed in the United Kingdom in relation to charges made for individual items. (Dunlop 1969).

Bolter (1969) suggests that patients on long-term treatment may not obtain repeat prescriptions as frequently as they should because they perceive themselves to be getting better and consequently reduce the amount of drug intake.

Chaves (1960) found that patients with active tuberculosis were more likely to take their drugs than patients with inactive tuberculosis.

Williams (1967) showed that there was a positive correlation between knowledge regarding diabetes and the degree to which patients carried out their regimes of treatment. On the other hand, Lendrum and Kobrin (1956) have reported that knowledge regarding rheumatic fever was not associated with maintenance of medical supervision.

Hernandez and Hackett (1962) report that in their observation of patients with recurring ulcers, the patients who did not understand the reason for their treatment or who had a fear of dying, or who were critical towards their physicians, were less likely to comply with their medical regimes.

Jackowska, in a study of 77 children in the diabetic out-patient clinic in Lodz, found that a factor of decisive significance for the compensation of diabetes is a quality

of self-control in the house, which depends directly on the social and living conditions.

All these studies bring into the consideration of the non-acceptance of treatment by patients a number of variables which are both difficult to measure and inter-related.

It might be reasonable to expect that patients would respond to additional clinical intervention or surveillance by improving their compliance with treatment regimes. This would be particularly true if they could discern that they were a group selected for special attention. This hypothesis is tested in this thesis.

Side Effects of Drugs

One of the factors which can influence non-compliance with drug therapy is adverse reaction to the drug.

Epidemiological evidence gained from prospective observation of hospital patients show an incidence of adverse reaction to drugs of between 10% and 18%. In ten reports - Schimmel (1964); Seidl et.al (1966): Smith et.al. (1966): Sidel et.al. (1967): Ogilvie and Riedy (1967): Hoddnott et.al. (1967): Simmons et.al.(1968): Stone et.al.(1969): Hurwitz and Wade (1969): Gardner and Watson (1970): Goodman and Gilman (1965) - 1496 adverse reactions were observed in 8562 patients, an incidence of 17.5%

Over one half of the adverse reactions were, in three of the studies, observed to be due to gastrointestinal or neurological effects - Seidl et.al (1966): Smith et.al.(1966): Hurwitz and Wade (1969), and over a third were due to gastrointestinal effects.

The occurrence of previous adverse reactions seems to have a positive correlation with subsequent reactions - Seidl et.al. (1966): Smith et.al.(1966): Ogilvie and Riedy (1967): Hurwitz and Wade (1969),

Personal factors may have predisposing significance. Genetic predisposition of adverse reaction to some drugs has been described - Goodman and Gilman (1965).

It may be reasonable to believe that gastrointestinal symptoms, which are rapidly percepted by the patient and readily related to drug intake and personal and genetic predisposing factors are emerging as significant.

REVIEW OF THE LITERATURE

SUMMARY

SUMMARY OF THE REVIEW OF THE LITERATURE

From the reports contained in the review, it is clear that there is widespread evidence of failure by patients to comply with medical regimes of treatment. Indeed it would be surprising to find that human behaviour was associated with total compliance.

The amount of failure has been estimated in a variety of ways. Few consistent results are found when the same method of estimation is used, and even greater inconsistencies are reported when two differing methods are used.

Results have been represented in terms of Doris Schwarz's telling quotations of elderly human confusion, and the hard analytical approach of authors like Willcox or Wynn-Williams.

Throughout the survey of the literature there runs the thread of uncertainty. This uncertainty is most evident in the interpretive aspects of reports. The presumption that tablets collected means tablets taken, is common. Interpretation of random urine tests in terms of continuous behaviour is unrealistic and causes significant problems. A lack of generally accepted standardisation of measurement methods is apparent.

Throughout the literature there is evidence, at times well concealed, and at times clearly revealed, that the element of human behaviour has a significant and almost

unmeasurable effect on compliance with medical regimes of treatment.

Taken together, the reports reviewed suggest that patients fail to take, on average, about 40% of their medicinal treatment. The questionnaire method, which suggests a lower failure of about 20%, is probably the least reliable.

A number of factors have been reported to affect compliance. Most significant have been the number of doses per day, the number of items of prescription, the duration of illness and the attitudes and behaviour of the patient. Sex, age, religion, race, education, marital state and social status have not been reported to have a clear association with failure to comply with medical regimes of treatment.

Despite the facility of a National Health Service, surprisingly little study of the problem has been reported from General Practice in the United Kingdom. On the other hand, previous research in General Practice has provided the necessary instruments for the work of this thesis.

Evidence of the effect of imposed clinical intervention on compliance with medicinal treatment has not been found in the literature; neither has the effect of the patient's perception of whether the diagnosis was made by a Consultant or General Practitioner.

It is expected that the results contained in this thesis will help towards a clearer understanding of some of the conflicts and difficulties encountered by previous observers.

THE STUDY

METHOD

THE STUDY - METHOD

Duration of the Study

Some of the preliminary work leading to the period of direct observation was carried out during the years 1967 - 1969

The study proper began in October 1969, when a detailed assessment of patients to be observed was started.

The direct observation took place between 1st April 1970 and 31st March 1971.

Patients

The patients included in the study were registered with a single partnership in an industrial town in South East Lancashire. The town has a long association with the production of cotton yarn and is located in an area of England and Wales which has the highest standardised mortality ratio for chronic bronchitis (National Atlas of Disease Mortality in the United Kingdom 1963). For the year when records were maintained for the purpose of this study, the mean of four quarterly measurements of list size was 3646.

For the whole duration of the study the patients were unaware that special observation of their compliance with treatment was taking place. The patient behaviour observed was their usual behaviour in general practice. The only exceptions were the patients included in the part of the study which involved an increased amount of clinical intervention.

Their behaviour could be expected to change, though their attitude towards compliance with treatment need not be a part of such behavioural change.

The Age/Sex Register

An Age/Sex Register was established for the practice in 1967. The system used was the A.S.R. card index system of the Royal College of General Practitioners.

A modification of the system which allows ease of calculation of the distribution of patients by age, sex, social status, and marital state, has already been described by the author (Lloyd G. 1970). The A.S.R. 2 cards used are illustrated in Figure 1.

The register was compiled over a period of six months and special support from the Executive Council facilitated this procedure.

Much of the data was obtained from the patient's medical record and the data which was not thus available was obtained either from the patient or from the Executive Council. When the compilation of the register was complete, the data was checked for a sample of patients against information available to the Executive Council, and found to be accurate.

The register was maintained up to and including the whole period of the work contained in this thesis, and provided some of the basic information which could be readily transferred on to the study record cards.

AGE/SEX RECORD CARDS

R.C.G.P.

FIGURE 1

A.S.R.2a **COLLEGE OF GENERAL PRACTITIONERS RECORDS and STATISTICS UNIT**

Card	Dr. Code							Surname of Patient				Forename		Date of Birth			Sex	MS	SS
1	2	3	4	5	6	7	8	9	10	11		12		13-14	15-16	17-18	19	20	21

Addresses
1.

2.

3.

Occupation

N.H.S. No. E.C.

Date (Entry) 22-23 24-25 26-27

Date (Removal) 28-29 30-31 32-33

Reason 34 35

Card to E.C. / /19

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	
36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	

A	B	C	D	E	F	G	H	I	J	K	L

SPECIAL INFORMATION

The Recording Card

Because the receptionists were familiar with the use of the A.S.R.2 cards, I decided to use a modification of this card to record information for the work of the thesis.

Assistance was given in the design and the production of the modified card by the General Practitioner Research Unit of the Royal College of General Practitioners, at Birmingham. The changes made in the format of the card are indicated in Figure 2.

Method of Obtaining Prescription

During 1967 a method of issuing repeat prescriptions was developed in the practice.

Each appropriate patient was separately advised of the method and given a printed instruction sheet (see Appendix 3) and was permitted to obtain a prescription in one of three ways:-

a) By personal request from the receptionist or the doctor.

b) By the request of a relative or friend at the surgery.

c) Through the post.

A record of the prescription, in precise terms, was entered on the patient's medical record card and any change in the long-term treatment necessitated a new entry. The envelope of the medical record card was labelled by means of a small metalic "tag" to facilitate its location in the record files.

STUDY RECORD CARD

FIGURE 2

ROYAL COLLEGE OF GENERAL PRACTITIONERS RESEARCH UNIT

Card 1 2 3	Date (Entry) Day	Mth.	Yr.	Surname of Patient 9 10 11	Forename 12	Date of Birth 13-14 15-16 17-18	Sex 19	MS 20	SS 21
1 0 1	31	3	69	[redacted]			M	M	4

DIAGNOSIS	DRUG
1 A INSOMNIA	SONERYL 100mg (60) ON
2 B CHRONIC BRONCHITIS	CHOLEDYL 200mg (100) tds
3	
4	
5	
6	
DOL 22 3 23 1	DOD 24 1 26 0 28 / 30 / 25 5 27 6 29 / 31 /

Month	DRUG 1	DRUG 2	DRUG 3	DRUG 4	DRUG 5	DRUG 6	DRUG
0							
1	✓	✓					
2							
3		✓					
4	✓						
5							
6	✓						
7	✓	✓					
8	✓	✓					
9	✓	✓					
10	✓	✓					
11	✓	✓					
12	✓	✓					
13							
MAF	3	4					

The method has characteristics which are similar to those described by other General Practitioners (Stevenson J.S.K. 1967: Walker K. 1971: Jolles K.E. 1973)

Each new prescription was signed by a doctor and the content checked against the medical record of the patient. Review of clinical conditions was commonly separated from the repeat prescribing and special arrangements made to recall patients for review at intervals which were usually longer than the month interval between prescriptions.

Changes in Prescriptions

During the period of the observation for this thesis, changes in prescriptions were of two kinds:-

a) Temporary changes in drug dosage or a short-term addition of new drugs. Changes in the dose of a drug was associated with an adjustment in the amount prescribed for a month and did not affect the count of prescriptions which were not collected. Short-term additions were ignored.

b) Changes in prescriptions which could be expected to continue for longer than six months, particularly when treatment was discontinued by the doctor, has required separate identification and analysis.

Identification of Patients with Chronic Illness

During the period October 1967 to October 1969, illness encountered in the practice was recorded on an 'E' Book Register (Eimerl T.S. 1969)

Patients who had chronic illness were thus identified and recorded in a special register. The diagnosis and treatment was reviewed for each identified patient, and where necessary, further investigation and consultant opinion sought. As far as possible, treatment was rationalised so as to reduce the number of medicines and their dosage to a minimum level consistent with maintained good health. For a number of patients in whom the diagnosis could not be substantiated, treatment was terminated. The termination of amphetamine prescribing has already been described (Lloyd 1973).

In October 1969 there were 659 patients entered in the register and could be separated into three groups:-

1. 54 patients who had not apparently required any medication from October 1967. These patients had come to the practitioner's attention for social reasons, such as a need for rehousing or the "Meals on Wheels" service.

2. 101 patients who had received occasional medication lasting for periods of less than three months

3. 504 patients who appeared to need continuous treatment for six months or longer.

The patients in group 3 were selected for special assessment as potential candidates for the observation of long-term treatment contained in this thesis.

The Assessment Consultation

During the period 1st October 1969 to 31st February 1970 assessment of potential entrants to the study was carried out by the author.

504 patients were reviewed: 478 by appointment at the surgery, and 26 in their own homes. Surgery appointments were made for each of the working days of the week and on most days three or four patients were interviewed. The Saturday morning surgery permitted some patients to be interviewed and was found to be a more convenient time for employed patients under the age of 65. On a few days six or seven patients were interviewed in order to accommodate the need for re-appointments.

At the time of the assessment consultation, the following information was obtained:-

1. An apparent need by the patient for continuing therapeutic treatment of six months duration or longer. When this need could not be established, further enquiry was not pursued. There were 11 such patients who were excluded from further observation.

2. The nature of therapeutic treatment was assessed in so far as items of treatment could be readily prescribed in definable monthly amounts. For all forms of tablet, injection, suppository, and liquid medicine, the amount of monthly prescriptions could be calculated. It was found impracticable to

evaluate an appropriate amount of creams and preparations administered as drops. 7 patients who required only such treatment were excluded from further enquiry.

486 patients were thus identified who were suitable for further observation. 2 of these died before the end of February 1970.

For the remaining 484 patients, the name, date of birth, sex, social status, and marital status of each was already known, and only confirmation was required at the time of the assessment consultation.

The following further information was obtained and recorded:-

1. <u>The Duration of Registration ("Duration on List" - D.O.L.)</u>
   The duration of registration with the practice was calculated to be that period of time between the date of entry on to the "list" and the first day of the period of observation (1st April 1970). The date of entry was recorded on the patient's record card in the Age/Sex Register and was confirmed with the patient. The recorded intervals were to the nearest one year.

2. <u>The Duration of the Diagnosis -(D.O.D.)</u>
   This was calculated from the information entered on the patient's medical record card by a General Practitioner, or from hospital correspondence, or from both of these sources, regarding the first diagnosis of the illness. The duration was recorded

in years to the nearest one year up to the time of the start of the observation.

The D.O.D. need not be equated with the duration of the long-term treatment. The measurement is included in order to determine if a relationship becomes apparent.

An attempt was made to estimate the duration of illness by an assessment of symptoms preceding a recorded diagnosis. It was found that achieving this was frustrated by a dependence on the memory recall of the patient and was not pursued for the purpose of this thesis.

3. Diagnosis Made by Consultant or General Practitioner

It was also decided to record whether the patient understood the diagnosis to have been established by a hospital Consultant or by a General Practitioner.

Information was obtained by direct questioning of the patient. In all but 16 instances there was a correlation with the information contained in the medical record. For the 16 instances at variance, 7 patients appeared to attribute the diagnosis incorrectly to a hospital Consultant, and 9 to a General Practitioner. For the purpose of the thesis the opinion of the patient was allowed to prevail. The study record numbers of the patients associated with variance are:-

115 121 138 219 245 279 446 454 490 512 519 532 581 618 653 666

4. The Prescription

The nature of each prescribed item of continuous long-term treatment was agreed with each patient and the frequency and amount of each item confirmed. This information was recorded. It was recognised that a change in clinical condition could influence these evaluations.

5. Method of Obtaining Prescription

It was established that each patient understood the procedure for obtaining a repeat prescription and where necessary, a new instruction sheet was made available. This sheet is shown in Appendix 3.

6. Confirmation of Diagnosis

The final part of the assessment consultation was concerned with ensuring both from the medical record and from the patient that the diagnosis of each identified chronic illness was supported by adequate evidence. The following criteria were accepted:-

a) That the diagnosis had been established by a hospital Consultant. In 5 instances clarification of hospital correspondence was sought and obtained.

b) That the diagnosis established by a General Practitioner contained adequate evidence of history (e.g. - angina), or of supportive investigation (e.g. - $\frac{FEVI}{FVC}$ of less than 70% for chronic bronchitis).

The full list of acceptable criteria is shown in Appendix 5 which contains all the diagnoses for the patients included in the study.

Recording of Data

The opportunities available to the patient to obtain a prescription has already been described.

When completed prescriptions were collected at the surgery or dispatched to the patient, a tick was placed in the appropriate box on the reverse side of the study record card, by the receptionist.

As will be seen later, it was a common practice for patients receiving multiple items of prescription to request and collect only some at a given time. Great care was required in order to ensure that the correct recording of the patient's selection was made by the receptionist. In order to test the receptionist's accuracy in recording, the author conducted a test at intervals of ten to fourteen days during the whole of the twelve-month period. It was found possible to do this by keeping a copy of the prescription and checking against the study record card at a time when the receptionists were not on the premises. During the whole of the period of the study, the receptionists were unaware of the fact that this observation was taking place, and it is greatly to their credit that the apparent correctness of their recording denied the need to bring inaccuracies to their attention.

The study record cards were arranged in alphabetical order, by sex, and contained in a special filing cabinet.

Repeat prescriptions given to patients during consultation were drawn to the attention of the receptionist for recording purposes. An appropriate entry was also made in the medical record card and at the end of the surgery the receptionist made an additional check by examining the records of patients which had the "tag" which indicated their inclusion in the study.

Some patients received prescriptions from other doctors during holiday periods. These were few in number and the prescriptions were appropriately recorded on the study record cards when the copy of the temporary residence form (EC.19) was received from other doctors.

Clinical Intervention

Luntz (1960) has shown that the failure of patients to take P.A.S. differs between hospital in-patient and hospital out-patients (2% failure for in-patients and 30% failure for out-patients). This study confirmed the previous impressions of Dixon (1957) and Breite (1958).

Parkes (1962) has suggested that more intervention by the General Practitioner would reduce the amount of failure of drug therapy among psychiatric out-patients. Porter (1969) observed in General Practice that the socially isolated patient complied less often with drug therapy. He also found that ante-natal patients (who presumably would be highly supervised) also have a poor record of compliance. Despite this last finding, Porter concludes "The risk of drug defaulting may be reduced by making every effort to ensure that all patients understand instructions and are supervised frequently".

Evidence of an attempt to relate compliance to a specially imposed clinical intervention by the General Practitioner has not been found in the literature.

For the work of this thesis such an enquiry has been undertaken. Two of the larger groups of patients included in the whole study were those with chronic bronchitis and those with anaemia. In the former, the effectiveness of long-term treatment by means of antispasmodic or antibiotic drugs has not been clearly demonstrated, whilst for patients who are anaemic the effectiveness of iron and cytamen are well established. Special arrangements were made to provide a high degree of supervision and intervention for these patients.

Chronic Bronchitis Group

Some of the chronic bronchitic patients included in the main study were used for this part of the observation.

A special weekly "clinic" was established at the surgery, which was exclusive to these patients, and conducted by the author. Each included patient was invited to attend this clinic and appointments were made for each patient at intervals of at least a month. Many patients attended more frequently. When a patient defaulted, a reminder was sent through the post together with a new appointment. Continued default was pursued by a home visit.

At the first attendance at the clinic a detailed history relevant to chronic bronchitis was obtained for each patient. For this purpose a pro-forma was designed and is illustrated in Appendix 8 . Clinical examination included measurement of the pulse rate, blood pressure, chest expansion by tape measurement, and clinical examination of the heart and lungs. A vitalograph machine was used to obtain a vitalogram both before and after inhalation of isoprenaline for each patient.

At subsequent attendances the history was confined to changes reported by the patient and, by direct questioning, changes in cough, sputum and breathlessness was recorded. Examination of the lungs and a further vitalograph was performed for each patient.

A radiograph of the chest was obtained soon after the first clinic consultation for each patient attending, or at least once during the subsequent duration of the trial. Haemoglobin estimations were also obtained.

Innoculation with influenza vaccine was carried out during September 1970.

This amount of clinical intervention is in excess of the usual surveillance in General Practice and for the patients involved was probably excessive.

Of the 99 patients with chronic bronchitis included in the main study,48 were invited to attend the special clinic. The remainder were a "control" group.

Selection of patients was made by inviting alternate patients from an alphabetically arranged list. The exceptions to this were two patients whose clinical state was such as to preclude clinic attendance. The patients included in the observation and "control" group are identified in the section describing the results.

The needs of the patient for further supplies of drugs was assessed by direct question though the known failure to take drugs was not communicated nor pursued with the patient. This form of intervention persisted for the twelve-month period of the over-all study.

Anaemia Group

This group included patients taking oral iron therapy and patients receiving cytamen injections for pernicious anaemia. A second "clinic" was arranged which was supervised by the District Nursing Sister. The clinic took place twice each week and patients with P.A. attended as often as they required injections.

In addition, patients with both P.A. and/or iron deficiency anaemia were interviewed by the author at three-monthly intervals.

At this interview an evaluation of the patient's symptoms was made and an examination of the conjunctiva, palms of the hands, and buccal mucosa was made at all attendances made to see the author, and a haemoglobin estimation obtained. An enquiry regarding the needs for drug was made but the known compliance was neither communicated nor pursued with the patient.

Of the 59 patients with one or other form of anaemia, 20 were selected for inclusion in the special clinic, selection being made as for patients with chronic bronchitis. Alternative arrangements were made for patients not included.

It was interesting to observe that soon after the clinics had been established, a number of patients who had not been included complained to the author and to the receptionists that they felt deprived of attention. Regrettably the frequency of the complaints was not measured as the event had not been anticipated.

Prescription Count

Disadvantage:-

Applicable to long-term only

Advantages:-

1. Objective
2. Can provide an absolute measure and concealment of observation can be absolute
3. Simple and inexpensive
4. Utilises existing G.P. practises
5. Could be extended to general use - Pricing Bureau
6. High degree of accuracy as patients registered with General Practitioner in the United Kingdom (exceptions - aspirin, paracetamol etc.)

RESULTS

RESULTS

Introduction

The results are described under appropriate sectional Tables.

The detailed Tables of Appendix 1 and Charts of Appendix 2 contain the information from which the Tables and Figures contained in the results were derived.

The unit of measurement and the way in which it was used is described in detail.

Conclusions are reached when there is substantial supporting evidence and comparisons made with previous reports.

Tables, Figures and Graphs relevant to the text are located on pages immediately following. Though it is appreciated that this procedure can make the reading more tedious, it was felt, on belance, that greater clarity of Tables could be achieved.

A clear indication of the formulae used in statistical calculations is made in the text. Statistical emphasis is, in general, confined to clearly defined levels of probability. In the whole of the results a probability of variation from chance in excess of ten per-cent has been ignored.

Some of the results permit positive inference, whilst others suggest a need for wider study.

For the most part, analysis of the results represents analysis of items of prescription or groups of prescriptions.

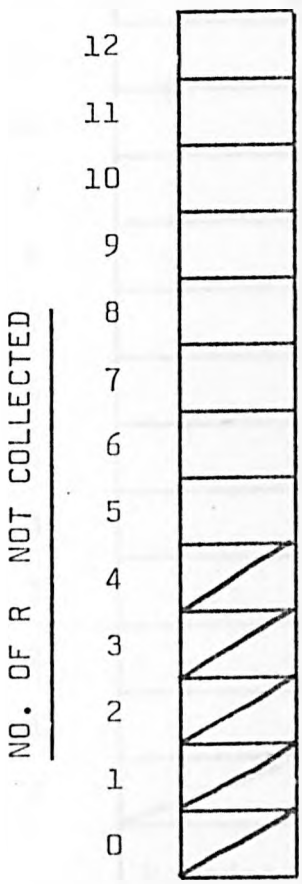
In terms of the age, sex, social status, and other considerations, the values relevant to each prescription has been included, though it is appreciated that where a single patient has multiple items of prescription, the same age, sex, social status and other measurements are also included more than once. It is considered that this method is more realistic than using mean measurements of multiple prescriptions.

The Unit of Measurement

The unit of measurement used in this study is the M.A.F. (Maximum Absolute Failure)

The measurement in terms of a single prescription for one patient for one year is shown in Figure 3.

Figure 3

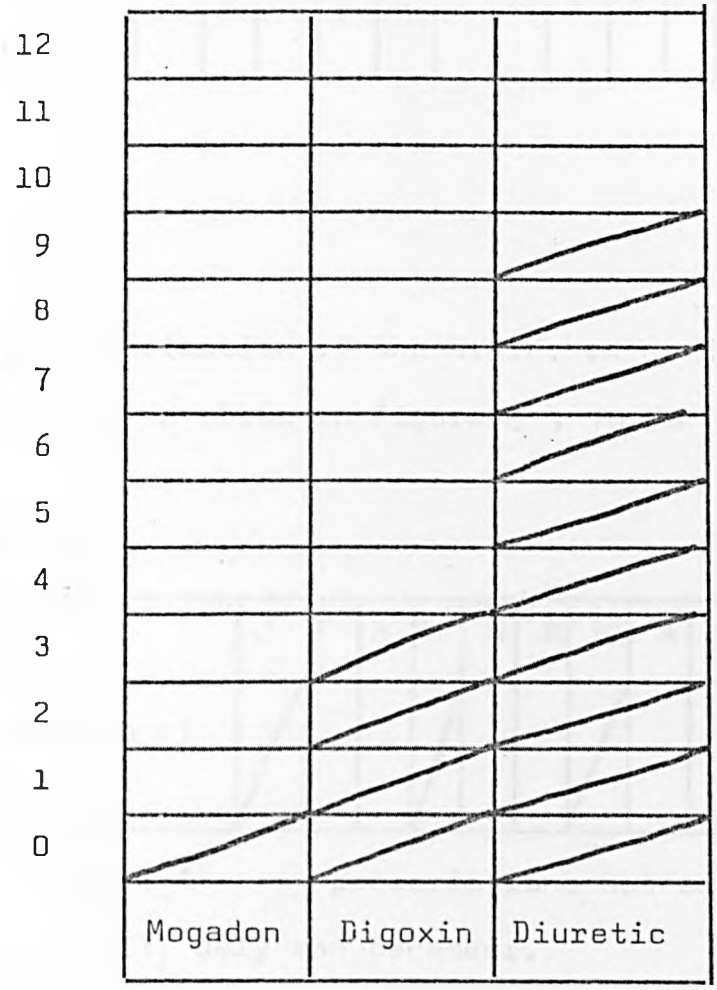


A patient who fails to collect 4 prescriptions in a year has an M.A.F. of 4.

The M.A.F. represents a maximum failure at the level of the issue of prescriptions. It is appreciated that the measurement could be modified to include prescriptions which have not been dispensed. This observation is pursued further in the "Discussion" section of the thesis.

Figure 4

Figure 4 shows that the value can vary for different drugs for the same patient.



For groups of patients the distribution of the M.A.F. between the possible alternatives is illustrated in Figure 5 , and permits inter-group comparisons.

Figure 5

M.A.F. Value	0	1	2	3	4	5	6	7	8	9	10	11	12
Distrib: of M.A.F. 100 males	6	4	8	8	8	9	10	4	8	10	11	8	6

The distribution of the M.A.F. value during the twelve month period is shown in Figure 6 , for a single prescription.

Figure 6

Month	J	F	M	A	M	JN	JU	A	S	O	N	D
Distribution of M.A.F.	/			/			/					/

M.A.F. value = 4 - prescriptions not collected in January, April, July and December.

From this the irregularity of failure to collect prescriptions can be discerned.

The charts of Appendix 2 have been compiled in this way

The M.A.F. of a group of patients is the sum of the M.A.F. of the individual patients.

The M.A.F. for a single patient who has two or more prescriptions is the sum of the M.A.F. for each individual prescription. For example:-

Patient No:	M.A.F.	
401	3	(0 + 3)
402	2	
403	4	
404	5	
405	4	(4 + 0)
406	1	(1 + 0)
407	6	(3 + 3)
409	14	(7 + 7)
GROUP M.A.F.	39	

The M.A.F. value for a particular drug is the sum of the M.A.F. for each patient prescribed the drug.

Distribution of M.A.F. Values According to Rank of Score

Each prescription included in the study has a M.A.F. value which can vary between unit values from 0 to 12.

The distribution of all M.A.F. values according to such ranking is as follows:-

M.A.F. Values	0	1	2	3	4	5	6	7	8	9	10	11	12
MALES	43	23	26	16	16	34	18	20	16	18	18	19	8
FEMALES	80	44	37	40	37	44	23	22	23	22	35	25	4
TOTAL	123	67	63	56	53	78	41	42	39	40	53	44	12

This distribution of M.A.F. scores has been used in the analysis of results as means of comparing two groups, for example, men against women.

Calculations

Though the statistical calculations contained in this thesis were made by the author, the assistance of Dr.M.J. Harris and Mr. A.C.C. Gibbs with the selection of tests and accuracy of results is gratefully acknowledged. This part of the work of the thesis has enlarged the author's understanding of statistical evaluation and the limits imposed on interpretation. An add-listing machine and a desk-top calculator were used to facilitate calculations.

For the most part, calculations are expressed to the nearest first decimal point. In some instances this has led to percentage distributions summating to other than 100%.

In the calculation of mean values the formula:-

$$\bar{x} = \frac{\sum x}{n}$$ or more commonly:-

$$\bar{x} = \frac{\sum fx}{\sum f}$$ where the frequency of distribution of values of x between the possible values is known.

In the calculation of the Standard Deviation of the frequency distribution, the formula:-

$$s = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}}$$ is used.

For comparison of distributions the Chi-square test is used.

The formula used for the comparison of means for samples over 30 is:-

$$(x) = \frac{(m_1 - m_2)}{\sqrt{\frac{s_1^2}{n\,1} + \frac{s_2^2}{n\,2}}}$$

For samples of less than 30, the comparison of means formula used is:-

$$t = \frac{(m_1 - m_2)}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \quad \text{where } S^2 = \frac{\Sigma(x^1 - m_1)^2 + \Sigma(x_2 - m_2)^2}{(n_1 - 1) + (n_2 - 1)}$$

and D.F. is $n_1 + n_2 - 2$

For correlation of rank differences, Spearman's correlation test of the sum of the squares of rank differences is used.

Where other formula have been occasionally used, reference is made in the text.

RESULTS

THE PATIENTS

The Patients

The selection of patients for the purpose of the observation contained in this thesis is described in the section on Method.

The partnership list of 3646 patients is distributed according to age and sex as shown in Table 5 , and compared with the distribution of England and Wales. There is a significantly higher proportion of older male patients and a smaller proportion of children. This distribution contributes to the relatively high incidence (12.8%) of registered patients with chronic illness and who also comply with the criteria for entry into the study.

The distribution by age of the patients included in the study compared with the partnership list is shown in Figure 7 . Predictably, a higher proportion of patients included in the study is in the older age groups. This characteristic has also been reported by Balint - ("Treatment or Diagnosis" page 23).

There were more women (281 = 60%) than men (186 = 40%) included in the study. Balint - ("Treatment or Diagnosis", page 33) describes a distribution of 112 women (63%) and 64 men (36%) out of 178 patients defined to be "long-term" repeat prescription patients; for two patients the sex had not been recorded.

In terms of Balint's definition of long-term treatment, patients requiring prescriptions for longer than six months, there is a close agreement in terms of age and sex between

TABLE 5

DISTRIBUTION OF POPULATION OF ENGLAND AND WALES *
COMPARED WITH DISTRIBUTION OF PARTNERSHIP LIST (P.L.)
BY AGE GROUP AND SEX

AGE GROUP	MALE		FEMALE	
	E & W	P.L.	E & W	P.L.
0-14				
No.	6.8M	386	6.5M	425
%	25.1	21.3	22.8	23.2
15-29				
No.	6.0M	365	5.8M	391
%	22.1	20.2	20.3	21.3
30-44				
No.	5.1M	268	4.9M	394
%	18.8	14.8	17.2	21.4
45-59				
No.	5.0M	316	5.3M	336
%	18.5	17.5	18.6	18.2
60 +				
No.	4.2M	473	6.0M	292
%	15.5	26.2	21.1	15.9
TOTAL	27.1M	1808	28.5M	1838
	100%	100%	100%	100%
	χ^2 = 148 DOF = 4 P = 0.001		χ^2 = 20 DOF = 4 P = 0.001	

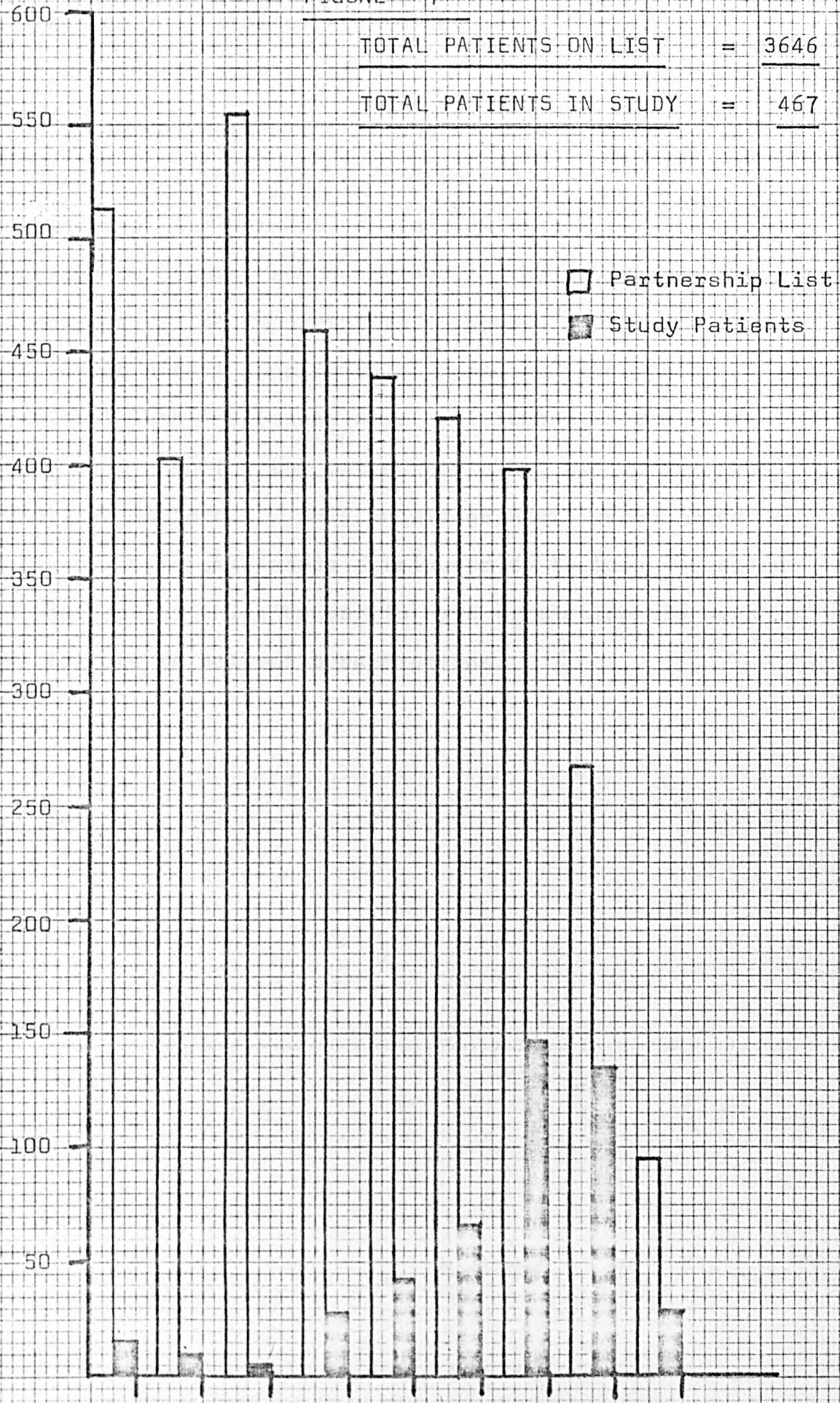
TOTAL PARTNERSHIP LIST = 3646

* = Social Trends No. 1. Central Statistical Office, 1970

FIGURE 7

TOTAL PATIENTS ON LIST = 3646

TOTAL PATIENTS IN STUDY = 467



COMPARISON OF PARTNERSHIP LIST WITH STUDY PATIENTS BY AGE

the patients identified by him and the patients included in the present study.

It is characteristic of the observations contained in this thesis that they were obtained without the knowledge of the patient. In view of the difficulties reported by others, and described in the Review of the Literature, it is important to recognise that whatever influences affect compliance with medical regimes of treatment such influences were undisturbed in the present study by a need for the patient to alter his or her usual behaviour pattern. This knowledge must increase the value of any significance attributed to factors described in the Results which appear to have a relationship with the failure to collect prescriptions.

RESULTS

ANALYSIS

Analysis of Results

During the planning of the study, consideration was given to the preparation of data in a form suitable for analysis by an I.B.M. 80 -column, 12 -line mechanical analyser at Manchester University, or by the computer at the Birmingham Research Unit.

Enquiries revealed that either would have been possible, and facilities would have been made available.

A number of advisers, however, recommended that the more protracted and tedious process of personal manual analysis would give greater benefit in terms of learning and understanding analytical process. This advice was taken though appropriate coding of the data on the recording cards for machine analysis was made.

Special analysis and calculation sheets were prepared. These are illustrated in Appendix 4

Undertaking a manual analysis has probably lengthened the duration of the analysis period, but the compensation, in terms of learning, make the effort worth while.

The Tables and Charts in Appendices 1 and 2 were prepared by the author.

The Tables and illustrations used in the thesis were also prepared by the author.

Reference was made to the following sources during the analysis and preparation of the results:-
Bourke and MacGilvary (1960), Oldham (1968), Loveday (1969) Langley (1968), Byrket (1972).

These books are now part of my personal library.

Total

Of the 484 patients included at the start of the period of observation (1st April 1970), five died and twelve removed from the list during the period of observation.

467 patients' records were complete at the end of the period of observation. The total diagnosis for these patients was 597 and the total number of prescription items was 711.

The distribution between male and female is shown in Table 6.

For the twelve month period of observation a possible total of 8532 prescriptions should have been collected.

The known number of prescriptions which were not collected was 3333. This amount of treatment could not have been taken and is the maximum absolute measure of the failure to comply with medical regimes of treatment as measured by prescription counts - (M.A.F.) - see Table 7

Thus, 39.1% of the long-term treatment recommended for 467 patients in a partnership of two doctors was not taken by the patients. Comparison with mean findings of other studies is shown in Table 8.

This finding does not agree with the report of Porter, who estimated by means of pill count that 16% of treatment was not taken by a group of 58 patients on long-term treatment. The difference may be due to differences in the practices or due to an unreliability of the pill counting method of estimating compliance, or some other variables. The prescription count method and the M.A.F. value, being independent

TABLE 6A

TOTAL NUMBER OF

PATIENTS, DIAGNOSES AND PRESCRIPTION ITEMS

	MALE	FEMALE	TOTAL
No. of Patients	186	281	467
No. of Diagnoses	216	381	597
No. of items of Prescription	225	436	711

3 male and 2 female patients died during the period of observation.

These were:-

MALES Nos: 186 234 244

FEMALES Nos: 432 561

5 male and 7 female patients removed from the partnership list during the period of observation.

These were:-

MALES Nos: 177 201 250 269 278

FEMALES Nos: 408 464 520 536 557 617 641

None of these patients are included in the analysis of the results, and represent a loss to the study of 3.5%

TABLE 6 B

NUMBER OF DIAGNOSES PER PATIENT

No. of Diagnoses per patient		1	2	3	4	Total
No. of patients:-						
Male	No.	158	26	2	0	186
	%	84.9	14.0	1.1	0	100
Female	No.	193	78	8	2	281
	%	68.7	27.8	2.8	0.7	100
Total Diagnoses:-						
Male	No.	158	52	6	0	216
	%	73.1	24.1	2.8	0	100
Female	No.	193	156	24	8	381
	%	50.7	40.9	6.3	2.1	100

χ^2 Male V Female for number of diagnoses = 29.1

DF = 2

$P < 0.1\%$

Percent of patients with more than one diagnosis:- MALES 15.1, FEMALES 31.3

TABLE 6C

DISTRIBUTION OF PRESCRIPTIONS BY NUMBER OF ITEMS PER PATIENT

		1 ITEM	2 ITEMS	3 ITEMS	4 ITEMS	TOTAL
MALE	No. of Patients	114	55	13	3	186
	No. of Prescriptions	114	110	39	12	275
FEMALE	No. of Patients	156	99	22	4	281
	No. of Prescriptions	156	198	66	16	436

χ^2 MALES v FEMALES = 1.86 D.O.F. = 3 P > 10%

TABLE 7

TOTAL MEASURED M.A.F. AS A PERCENTAGE OF POSSIBLE M.A.F.

Alternatives of M.A.F.	1	2	3	4	5	6	7	8	9	10	11	12	Total	No.of R
M.A.F.														
(Male	23	52	48	64	170	108	140	128	162	180	209	96	1380	275
(Female	44	74	120	148	220	138	154	184	198	350	275	48	1953	436
Male & Female	67	126	168	212	390	246	294	312	360	530	484	144	3333	711

Total different R = 275 (Males) + 436 (Females) = 711

Total possible M.A.F. = 711 x 12 = 8532

Therefore actual M.A.F. represents $\frac{3333}{8532} \times \frac{100}{1}$ = 39.1% of possible M.A.F.

M.A.F. = 0 for males = 43 prescriptions

M.A.F. = 0 for females = 80 prescriptions

M.A.F. = 0 for males and females = 123 prescriptions

TABLE 8

NON-COMPLIANCE

Expressed as a percentage:-

Questionnaire	26%	(mean of 14 reports)
Pill counting	42%	(mean of 13 reports)
Urine Testing	37%	(mean of 18 reports)

Present Study:-

Prescription Count	39%

Comparison of the overall results of the measurement of non-compliance by the method described in this thesis and other methods reported in the literature is shown in Table

The results of the prescription count is of the same order as the pill counting and urine testing methods.

of patient awareness of observation, could be used in more extensive studies involving larger numbers of patients registered with a greater number of doctors.

Effect of Failure to Collect Prescriptions on Cost of Drugs.

During October 1970, the number of all items of prescription counted by the Pricing Bureau for the practice was 1489. The M.A.F. value for the same month was 273 and represents 15.5% of the sum of the two.

In October 1970 therefore, the cost of drugs sustained by the N.H.S. was reduced by at least this contribution.

More extensive studies would reveal more closely the annual saving to the N.H.S. by the failure of patients to collect prescriptions.

The number of prescriptions with a M.A.F. score of 0 is 123, and represents 17.3% of all prescriptions. Patients who have such prescriptions might be described as wholly compliant. It is expected however, that the number and proportion of prescriptions with a M.A.F. of 0 would diminish if the duration of observation were continued.

The number of prescriptions with a M.A.F. score of 12 is 12. These prescriptions represent 1.7% of all prescriptions and are those of patients who can be described as wholly non-compliant.

There is therefore a significant difference between results which are expressed in terms of the wholly compliant and wholly non-compliant patient. This observation may explain some of the difficulties encountered in estimating compliance by means of repeated urine tests.

Duration of Observation, and Month of First Failure

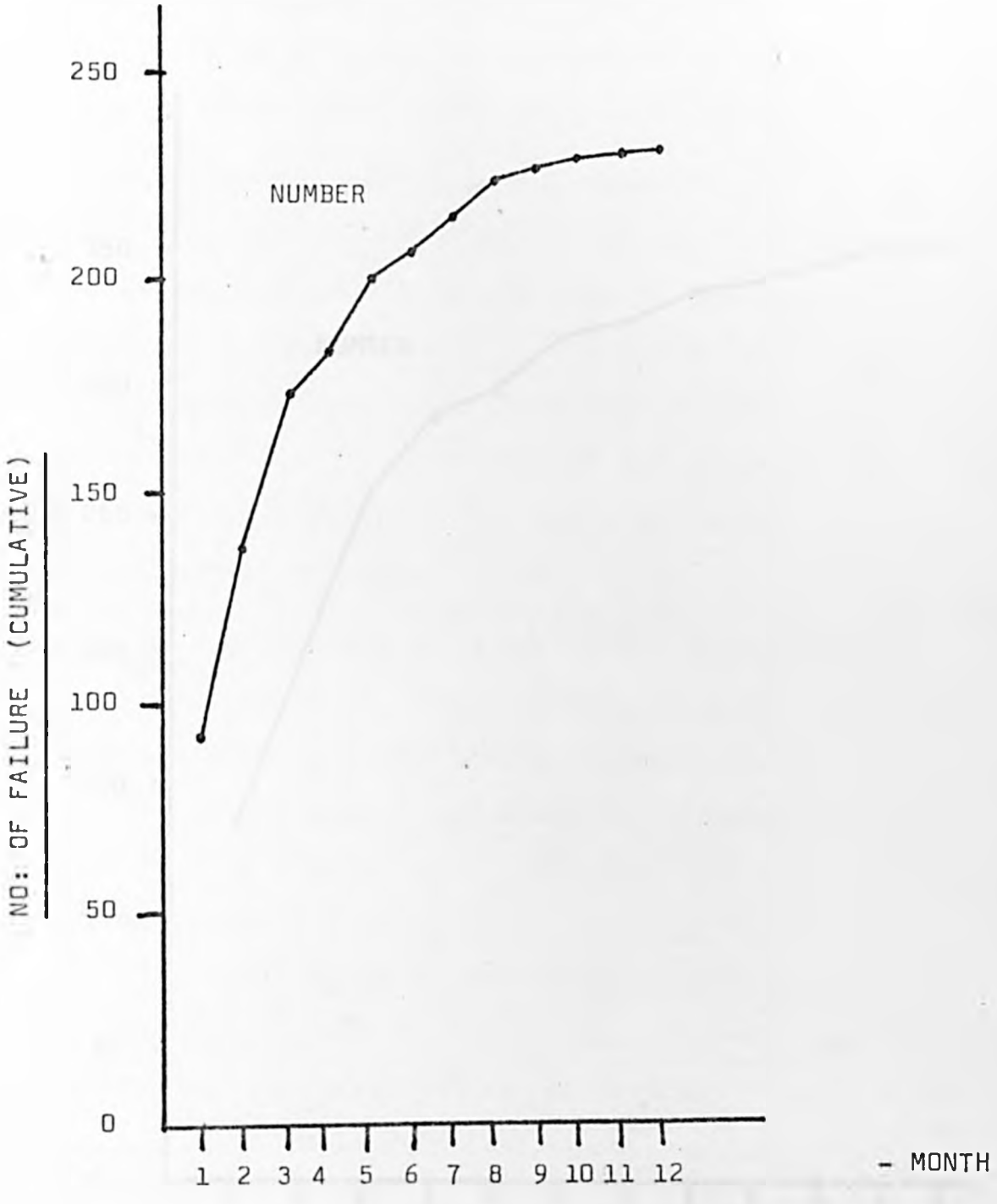
Of the 436 prescriptions for women, there were 80 instances when there was no failure to collect a prescription (i.e. M.A.F. = 0). For men there were 43 such instances.

Figure 8 and Figure 9 show that the cumulative failure - (M.A.F.) - month by month, increases rapidly for the first eight months and achieves an almost constant level by the twelfth month.

Whilst it is predictable that, given sufficient opportunity, all patients would eventually fail to collect prescriptions, it would be reasonable to say, from the findings of this study, that over a period of one year, the M.A.F. measurement provides an accurate evaluation of the patients' failure to comply with medicinal treatment.

FIGURE 8 MALES

MONTH	1	2	3	4	5	6	7	8	9	10	11	12
NO: OF FIRST FAILURE. CUMULATIVE	93	136	173	184	201	208	217	226	228	230	231	232

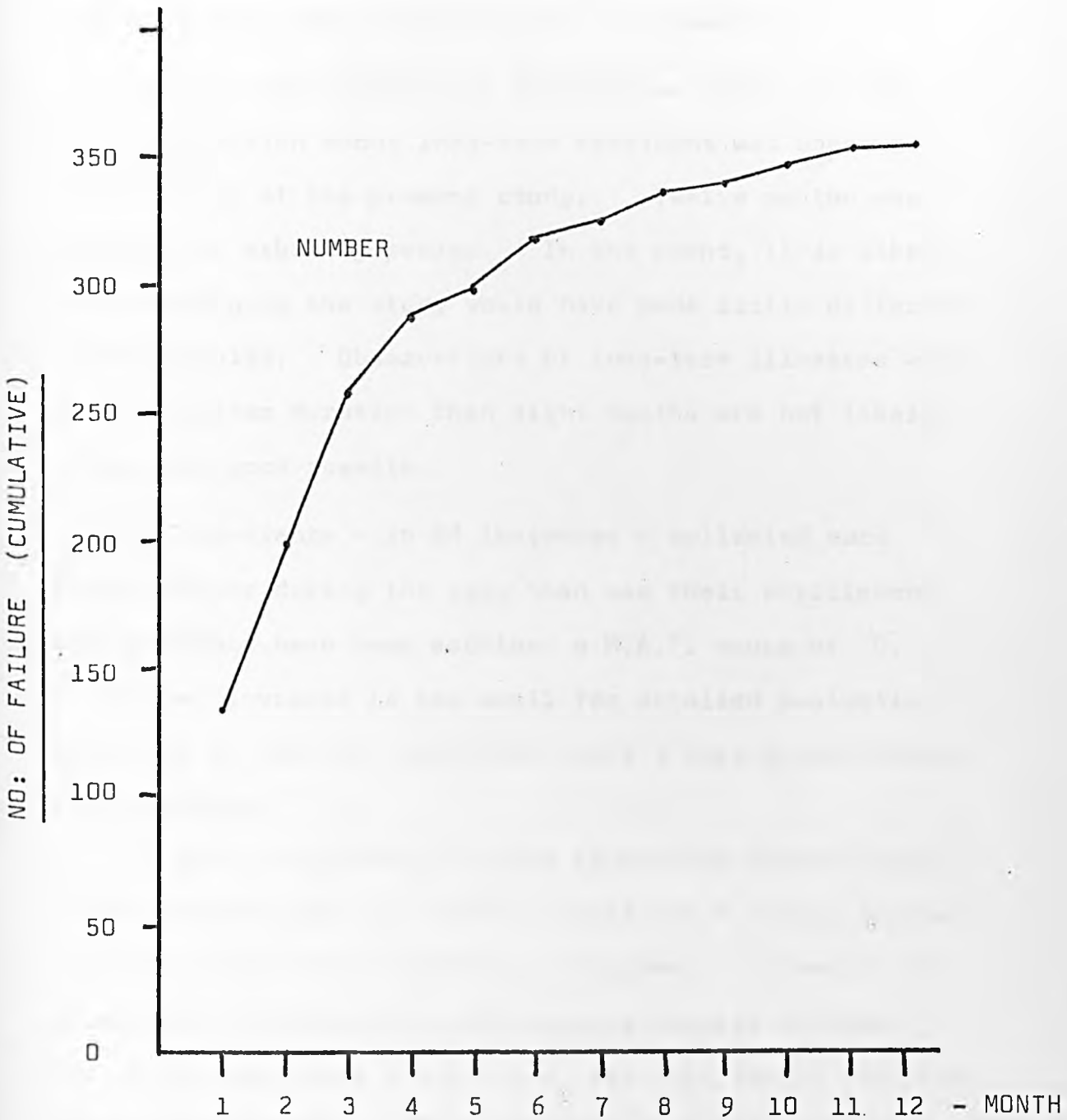


CUMULATIVE FAILURE TO COLLECT PRESCRIPTIONS

BY FIRST MONTH OF FAILURE

FIGURE 9 FEMALES

MONTH	1	2	3	4	5	6	7	8	9	10	11	12
NO: OF FIRST FAILURE. CUMULATIVE	134	199	258	287	298	318	325	336	341	348	354	356



CUMULATIVE FAILURE TO COLLECT PRESCRIPTIONS

BY FIRST MONTH OF FAILURE

Figure 10 and Figure 11 show the relationship between the duration of the study and the cumulative value of M.A.F. expressed as a percentage of possible M.A.F.

The regression line is close to a line which passes through the origin for men and women. This would suggest that failure to collect prescriptions accumulates in a regular manner when many patients are observed.

The optimal duration of observation which provides good information about long-term treatment was unknown at the start of the present study. Twelve months was taken as an arbitary period. In the event, it is likely that prolonging the study would have made little difference to the results. Observations of long-term illnesses which are of shorter duration than eight months are not likely to provide good results.

Some patients - in 14 instances - collected more prescriptions during the year than was their entitlement. Such patients have been ascribed a M.A.F. score of 0. The number involved is too small for detailed evaluation, though it is perhaps significant that 9 were prescriptions for hypnotics.

It would have been of value to continue surveillance of patients who had 0 M.A.F. scores for a longer period, in order to determine subsequent failure. However, the group was not identified sufficiently quickly nor the situation adequately anticipated, with the result that the opportunity passed. This omission is a criticism both of planning and alertness.

FIGURE 10

DISTRIBUTION OF CUMULATIVE M.A.F.
AS A PERCENTAGE OF POSSIBLE M.A.F.

MALES

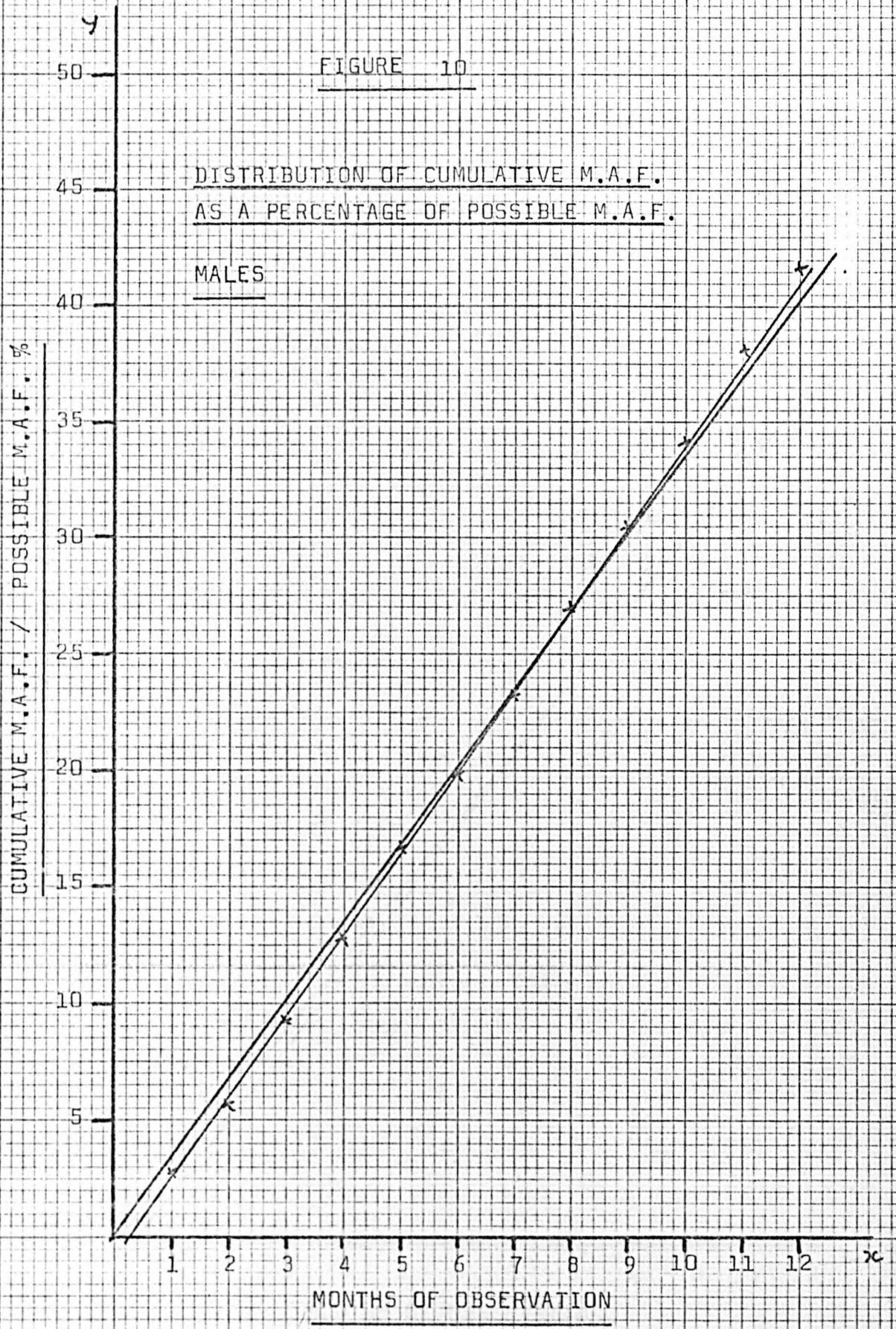
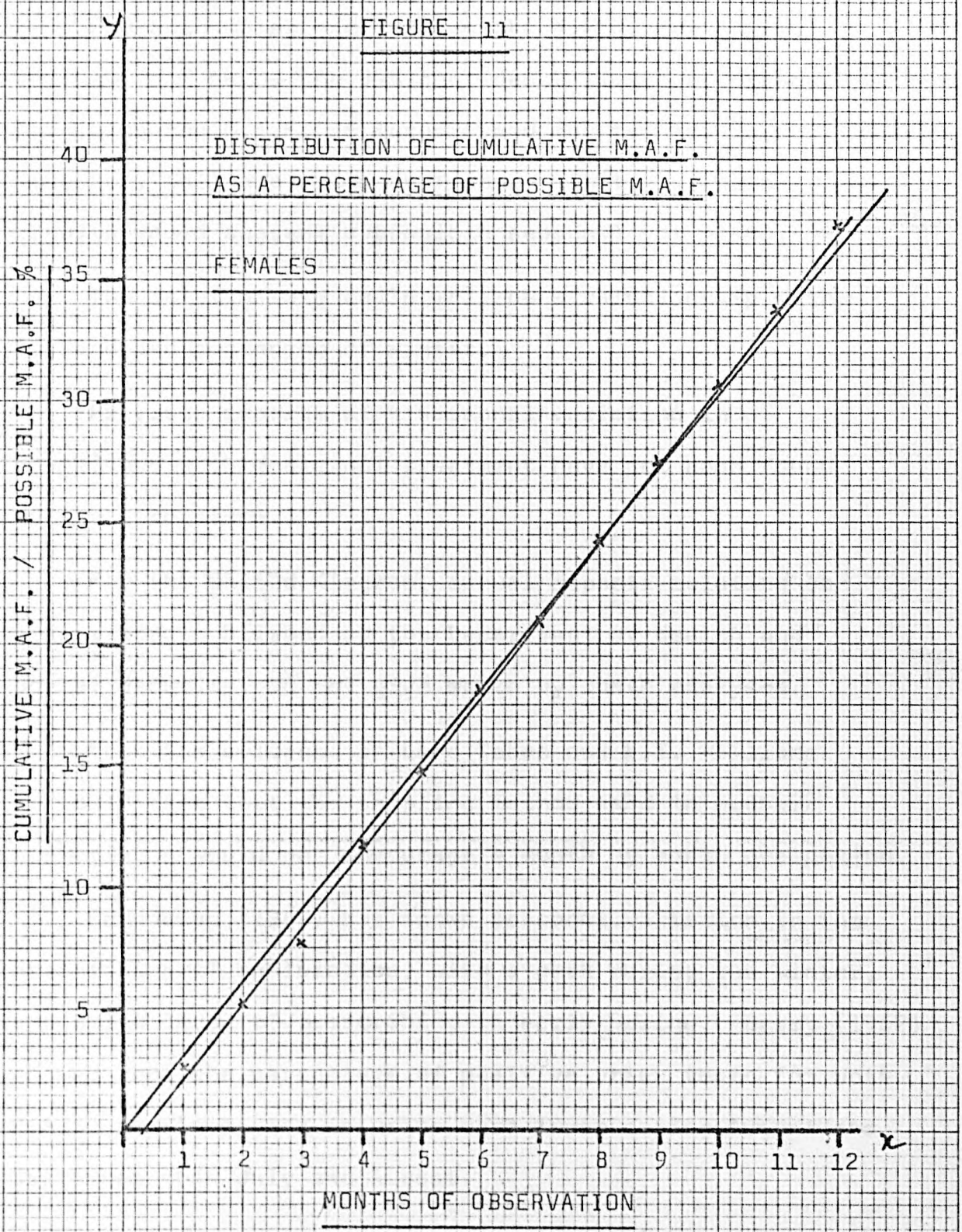


FIGURE 11

DISTRIBUTION OF CUMULATIVE M.A.F.
AS A PERCENTAGE OF POSSIBLE M.A.F.

FEMALES



Distribution According to Month of Year

Figure 12 and Figure 13 show the respective distribution by month of year of the M.A.F. for males and females.

For both males and females the M.A.F. for April and May fall below the 99% confidence limits of chance. For males the M.A.F. in August, and for females in November, fall above the confidence limit. These results would suggest a possible seasonal variation.

The relationship could well be a relationship with the end and beginning of winter.

Previous reports of a seasonal variation in compliance with medicinal treatment have not been found in the literature.

For the United Kingdom, annual reports relating to prescribing published by the Department of Health and Social Security, do not give month by month analyses.

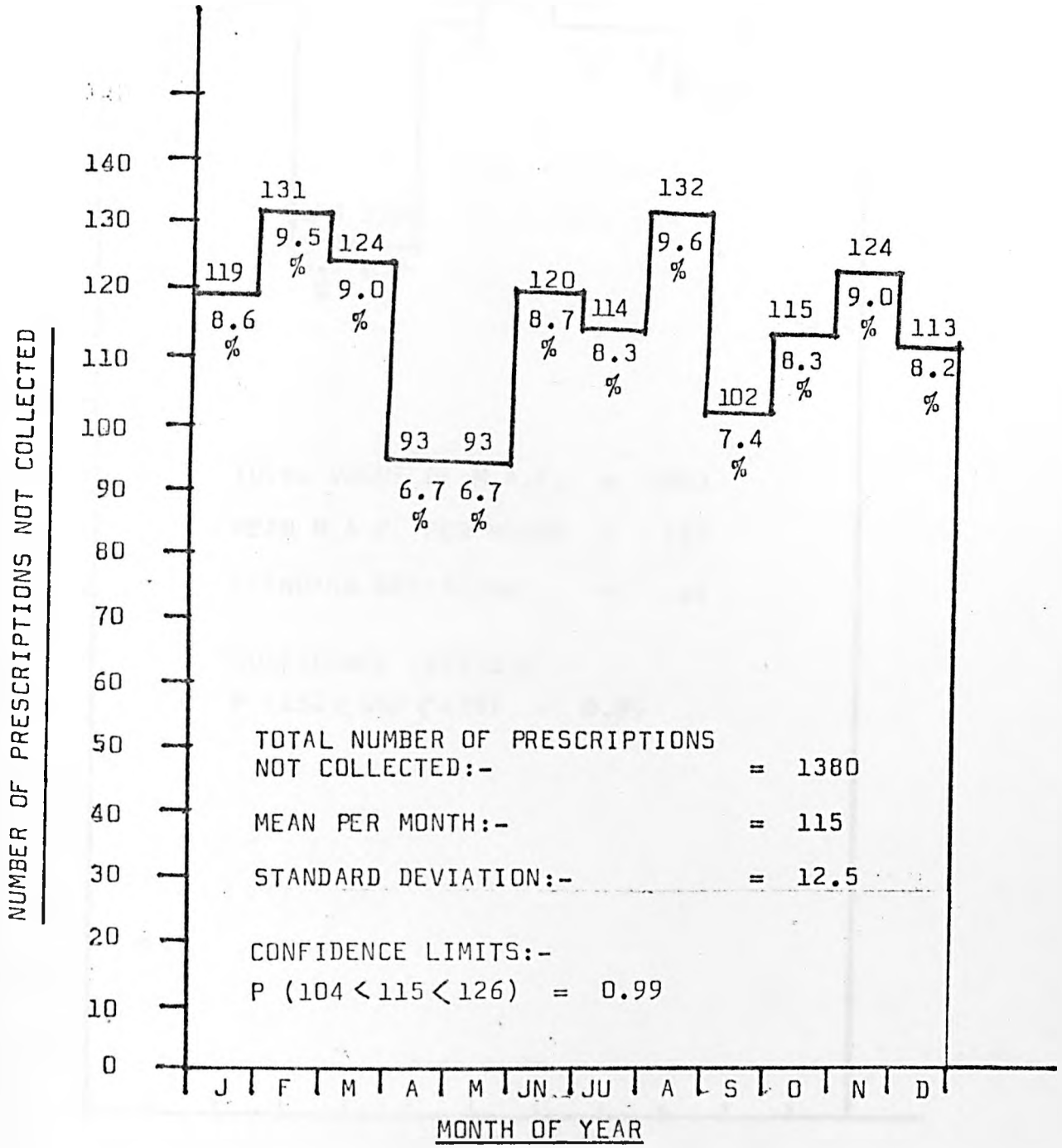
From the evidence of Lord Cohen and E.T. Williams it would seem that the sampling method used to measure prescribing would not encourage a month by month evaluation.

Edmondson (1969) has shown seasonal variation in the prescribing of antibiotics, with a peak during the winter, and a low level of prescribing in early Spring. Berry (1962) showed that the percentage of positive urine tests for both P.A.S. and Isoniazad in urine were lower during August and September than July and August.

The results of the present study can be interpreted, with caution, to suggest that failure to take medicinal treatment for long-term illness may vary according to the time of year.

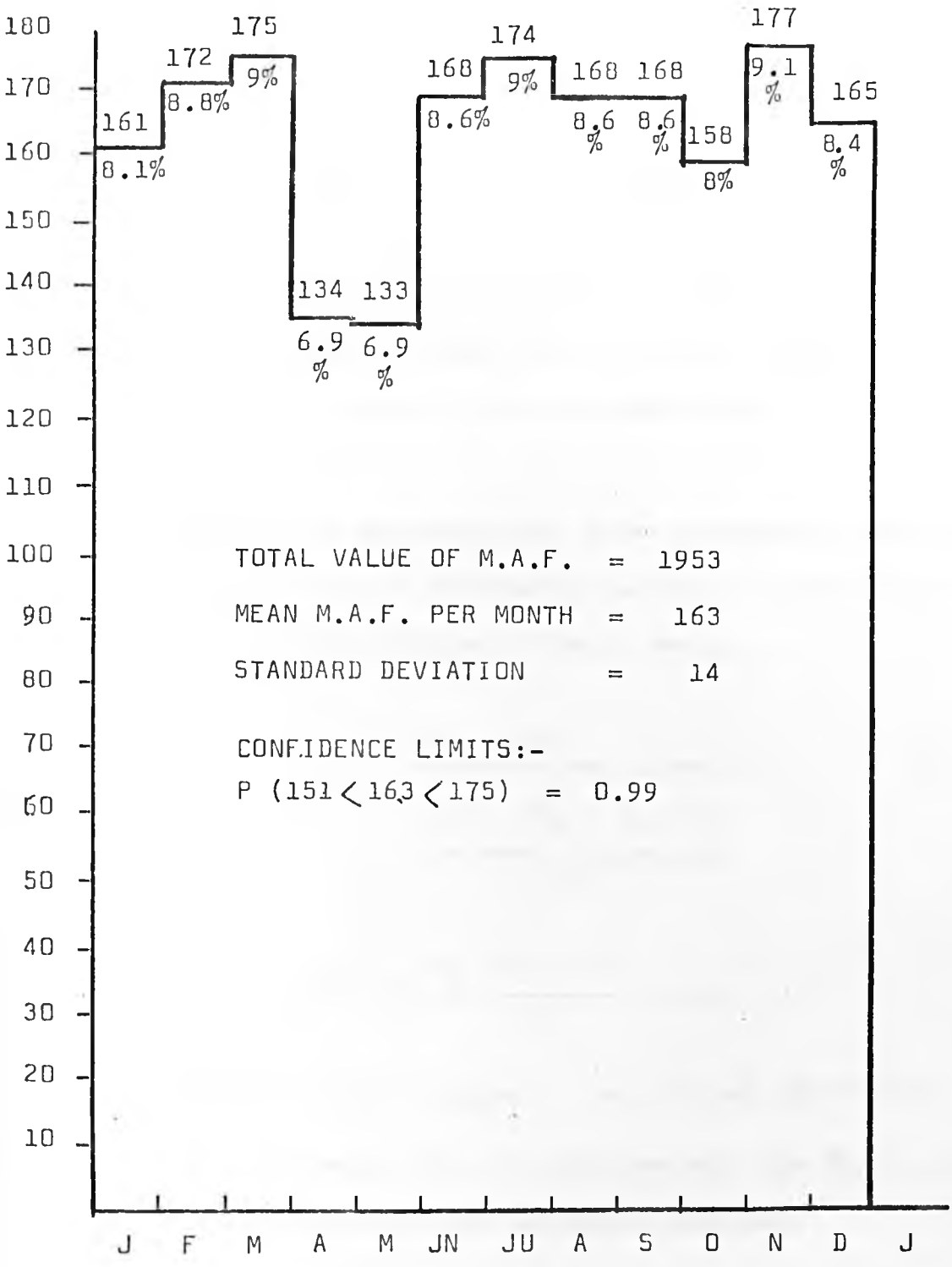
This unexpected finding requires confirmation, preferably in a more widely dispersed and larger population.

Figure 12



DISTRIBUTION OF TOTAL PRESCRIPTIONS NOT COLLECTED BY MONTH OF YEAR FOR MALES

Figure 13



DISTRIBUTION OF TOTAL M.A.F. BY MONTH OF YEAR

FOR FEMALES

Sex

The distribution of M.A.F. values according to sex is shown in Table 9, and Figure 13.5 A negatively skewed distribution is apparent. From the Chi-square test a difference between M.A.F. values between males and females is found to be not significant at the 10% level.

Because of the deviation from a normal distribution the significance of difference can also be estimated by means of the Mann Whitney U Test, where -

$$z = \frac{U - n_1 n_2}{\sqrt{\frac{n_1 n_2 (n_1 + n_2 + 1)}{12}}}$$

and $U = n_1 n_2 + \frac{n_1 (n_1 + 1)}{2} - R$

From this calculation $z = 1.9$ and $5\% > P > 2\%$

Any difference which exists between the M.A.F. of males and females is statistically marginal.

This result agrees with the findings of most other observers that there seems to be no major significant influence of sex on the failure to take medicinal treatment.

TABLE 9

DISTRIBUTION BY FAILURE RATE - MALES COMPARED WITH FEMALES

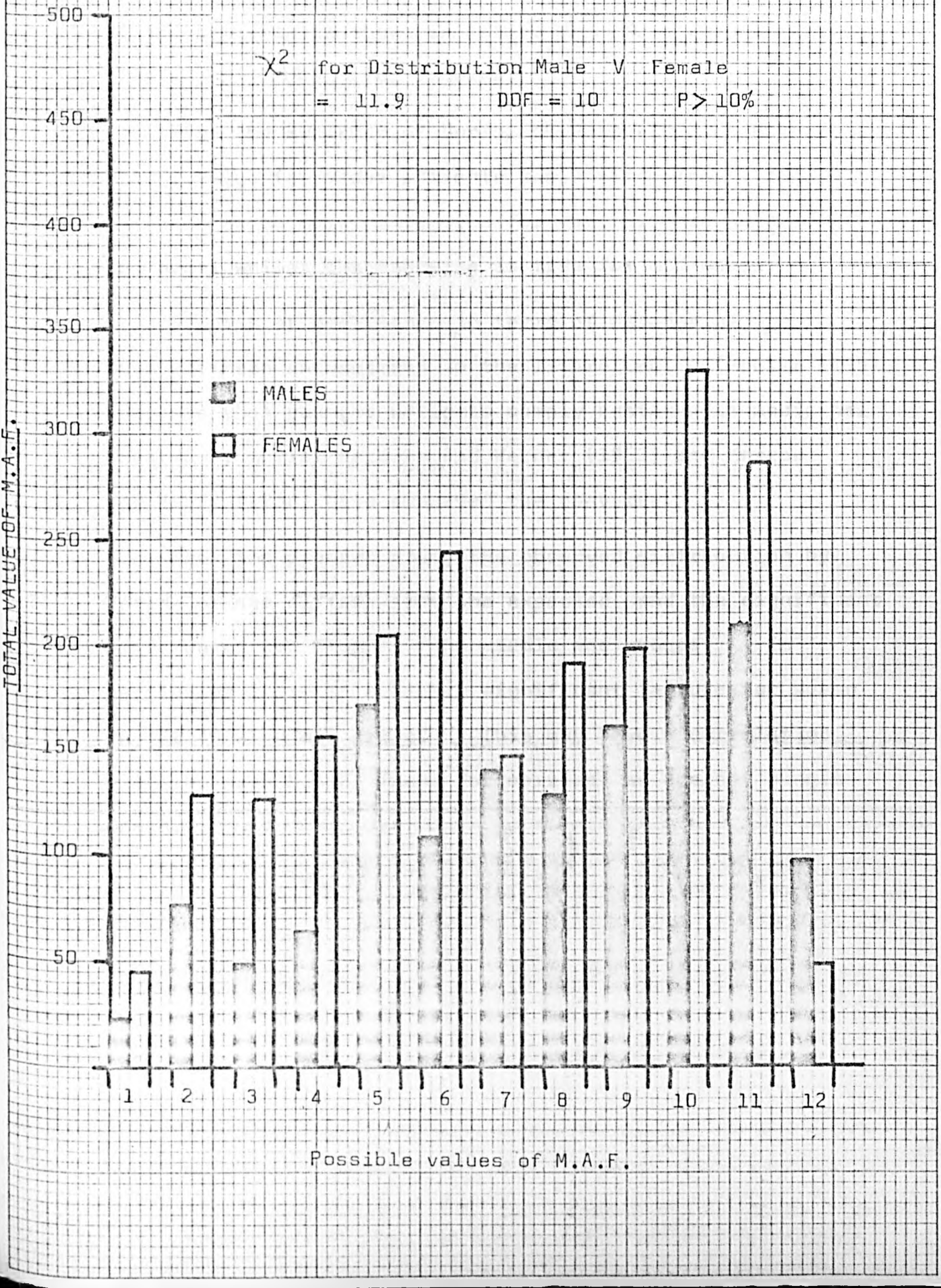
M.A.F. Value	0	1	2	3	4	5	6	7	8	9	10	11	12	Total
MALES:														
NO: R	43	23	26	16	16	34	18	20	16	18	18	19	8	275
%	15.7	8.4	9.5	5.8	5.8	12.4	6.5	7.3	5.8	6.5	6.5	6.9	2.9	
Score	0	23	52	38	64	170	108	140	128	162	180	209	96	1380
FEMALES:														
NO: R	80	44	37	40	37	44	23	22	23	22	35	25	4	436
%	18.3	10.1	8.5	9.2	8.5	10.1	5.3	5.0	5.3	5.0	8.0	5.7	0.9	99.9
Score	0	44	74	120	148	220	138	154	184	198	350	275	48	1953

Male V Female χ^2 = 11.86 DOF = 10 Significance P > 10%

Male V Female Mann Whitney U Test:- z = 1.99 P = 0.045

Figure 13.5

TOTAL VALUE OF M.A.F. ACCORDING TO POSSIBLE VALUES FOR MALES AND FEMALES



M.A.F. According to Age

The distribution of M.A.F. according to the age of the patients is shown in Tables 10,11,& 12 for males and Tables 13,14 & 15 for females.

From the evidence of Doris Schwartz (1962) a higher M.A.F. value for older patients was anticipated. This is found to be marginally true for very old men (age 80 and over) whilst the converse is true for old women.

Reports of compliance in terms of decades of age have not been encountered in the literature. (Mohler 1955) suggests that younger patients comply better with medicinal treatment, whilst Bergman and Werner (1963) and Morrow and Rabin (1958) have observed the converse.

From the present study the observed distribution by decade of age differs from the expected, and the significant differences are found in the middle age groups. In particular there is a highly significant failure for women in the 40 - 49 age group. This may have a correlation with the high M.A.F. found for married, as against single women.

TABLE 10

DISTRIBUTION OF M.A.F. ACCORDING TO AGE GROUP (DECADES) - MALE

M.A.F.

Age Group	0	1	2	3	4	5	6	7	8	9	10	11	12	Total R in Group
0 - 9	2	1	0	1	2	2	1	3	0	0	0	1	0	13
10 - 19	2	1	1	0	1	0	1	1	1	0	0	2	0	10
20 - 29	0	0	0	0	0	3	0	0	0	1	2	0	0	6
30 - 39	1	3	0	1	0	3	0	1	2	1	1	2	0	15
40 - 49	3	1	4	0	0	2	0	3	1	5	4	2	2	27
50 - 59	2	4	4	4	3	4	4	2	3	4	3	3	1	41
60 - 69	19	7	11	4	6	8	7	5	7	4	5	3	3	89
70 - 79	14	6	6	6	2	9	3	1	2	3	2	5	1	60
80 +	0	0	0	0	2	3	2	4	0	0	1	1	1	14
TOTAL	43	23	26	16	16	34	18	20	16	18	18	19	8	275
%	15.7	8.4	9.5	5.8	5.8	12.4	6.5	7.3	5.8	6.5	6.5	6.9	2.9	100

TABLE 11

DISTRIBUTION OF TOTAL M.A.F. FOR MALES ACCORDING TO AGE GROUP

TOTAL OBSERVED M.A.F. = 1380

Age Group	No. of Prescriptions	Observed Distribution of M.A.F.	Expected Distribution of M.A.F.
0 - 9	13	60	65
10 - 19	10	50	50
20 - 29	6	44	30
30 - 39	15	85	75
40 - 49	27	179	135
50 - 59	41	229	206
60 - 69	89	393	447
70 - 79	60	244	301
80 +	14	99	70
TOTAL	275	1380	1379

$\chi^2 = 46$ D.O.F. = 8 $P < 0.1\%$

TABLE 12

MEAN, STANDARD DEVIATION AND SIGNIFICANCE OF M.A.F. BY AGE GROUP (MALES)

Age Group	No. of R in Group	Total Group M.A.F.	Mean Group M.A.F. (m)	Standard Deviation (s)	(x)	Significance
0 - 9	13	60	4.6	3.0	-	-
10 - 19	10	50	5.0	4.0	-	-
20 - 29	6	44	7.3	3.5	-	-
30 - 39	15	85	5.7	3.4	-	-
40 - 49	27	179	6.6	4.3	2.1	$5\% > P > 1\%$
50 - 59	41	229	5.6	3.5	0.9	$P > 10\%$
60 - 69	89	393	4.4	3.7	0.8	$P > 10\%$
70 - 79	60	244	4.1	3.8	1.5	$P > 10\%$
80 +	14	96	6.9	3.0	2.1	$5\% > P > 1\%$
TOTAL	275	1380	5.0	3.7		

Significance is significance of comparison of group mean with mean for all males

For no. of R v Group M.A.F. $\chi^2 = 46$ D.F. = 8 $P < 0.1\%$

TABLE 13

DISTRIBUTION OF M.A.F. ACCORDING TO AGE GROUP (DECADES) - FEMALE

M.A.F.

Age Group	0	1	2	3	4	5	6	7	8	9	10	11	12	Total R in Group
0 - 9	1	1	2	2	0	1	1	0	0	0	0	1	1	9
10 - 19	0	0	0	0	0	1	0	0	0	1	0	0	0	2
20 - 29	1	0	1	0	0	0	0	0	0	0	0	0	0	2
30 - 39	1	1	0	4	3	2	0	2	4	4	2	1	1	25
40 - 49	1	1	5	2	4	1	6	0	2	2	4	7	0	35
50 - 59	6	7	5	6	5	10	5	3	2	2	7	2	0	60
60 - 69	24	18	9	11	11	15	5	10	5	7	12	5	1	133
70 - 79	37	15	9	12	12	14	5	6	8	5	8	10	1	142
80 +	0	1	6	3	2	0	1	1	2	1	2	0	0	28
TOTAL	80	44	37	40	37	44	23	22	23	22	35	25	4	436
%	17.7	10.3	8.7	9.6	8.9	9.4	5.5	4.8	5.5	5.0	7.6	6.0	0.9	99.9

TABLE 14

DISTRIBUTION OF TOTAL M.A.F. FOR FEMALES ACCORDING TO AGE GROUP

TOTAL OBSERVED M.A.F. = 1953

Age Group	No. of Prescriptions	Observed Distribution of M.A.F.	Expected Distribution of M.A.F.
0 - 9	9	34	40
10 - 19	2	14	9
20 - 29	2	2	9
30 - 39	25	160	112
40 - 49	35	225	157
50 - 59	60	282	269
60 - 69	133	578	596
70 - 79	142	570	636
80 +	28	88	125
TOTAL	436	1953	1954

$\chi^2 = 78$ D.O.F. = 8 $P < 0.1$

TABLE 15

MEAN, STANDARD DEVIATION AND SIGNIFICANCE OF M.A.F. BY AGE GROUP (FEMALE)

Age Group	No. of R in group	Total Group M.A.F.	Mean Group M.A.F. (m)	Standard Deviation (s)	Significance
0 - 9	9	34	3.8	3.4	$P > 10\%$
10 - 19	2	14	-	-	-
20 - 29	2	2	-	-	-
30 - 39	25	160	6.4	3.2	$10\% > P > 5\%$
40 - 49	35	225	6.4	3.5	$P < 0.2\%$
50 - 59	60	282	4.7	3.3	$P > 10\%$
60 - 69	133	578	4.4	3.5	$P > 10\%$
70 - 79	142	570	4.0	3.7	$P > 10\%$
80 +	28	88	3.1	3.3	$10\% > P > 5\%$
TOTAL	436	1953	4.5	3.6	

Mean M.A.F. all women = 4.5

Marital State

The distribution of M.A.F. according to the marital state of the patient for each prescription is shown in Table 16 for men and Table 17 for women.

The only significant difference found has been between single and married women. This comparison has not been found previously reported.

The statistical significance is of a high order and would suggest a need to consider this factor in any future studies. It would be of interest to determine the comparative attitude of the single woman and the married woman in terms of compliance with medicinal treatment.

The results of the present and other studies show that age is not a related factor, in so far as children included in the observation do not affect the results in terms of marital state.

TABLE 16

M.A.F. ACCORDING TO MARITAL STATE - MALES

Possible M.A.F.	0	1	2	3	4	5	6	7	8	9	10	11	12	Total	Mean	SD
Single:-																
No. of R	5	4	2	3	4	5	2	4	0	2	2	3	0	36	4.7	3.45
M.A.F. Score		4	4	9	16	25	12	28	0	18	20	33	0	169		
Married:-																
No. of R	37	16	22	11	8	27	16	14	16	15	15	14	7	218	5.1	4.2
M.A.F. Score		16	44	33	32	135	96	98	128	135	150	154	84	1105		
Widowed and Divorced:-																
No. of R	1	3	2	2	4	2	0	2	0	1	1	2	1	21	5.05	
M.A.F. Score		3	4	6	16	10	0	14	0	9	10	22	12	106		
TOTAL:-																
No. of R	43	23	26	16	16	34	18	20	16	18	18	19	8	275	5.0	3.7
M.A.F. Score		23	52	48	64	170	108	140	128	162	180	209	96	1380		

Comparison of Means:-

Mean Single V Mean Married (x) = 0.6 P > 10%

TABLE 17

M.A.F. ACCORDING TO MARITAL STATE - FEMALES

Possible M.A.F.	0	1	2	3	4	5	6	7	8	9	10	11	12	Total	Mean	SD
Single:-																
No. of R	18	10	6	4	0	8	4	0	3	3	3	1	1	61	3.3	3.5
M.A.F. Score		10	12	12	0	40	24	0	24	27	30	11	12	202		
Married:-																
No. of R	39	26	25	23	26	25	13	17	15	13	24	18	3	267	4.8	3.6
M.A.F. Score		26	50	69	104	125	78	119	120	117	240	198	36	1282		
Widowed and Divorced:-																
No. of R	23	8	6	13	11	11	6	5	5	6	8	6	0	108	4.3	3.5
M.A.F. Score		8	12	39	44	55	36	35	40	54	80	66	0	469		
TOTAL:-																
No. of R	80	44	37	40	37	44	23	22	23	22	35	25	4	436	4.5	3.6
M.A.F. Score		44	74	120	148	220	138	154	184	198	350	275	48	1953		

Comparison of means:-		(x)	P
Mean all women V	(Single	2.5	10% > P > 0.02%
	(Married	1.1	P > 10%
	(Widowed and Divorced	0.6	P > 10%
Mean single V Mean Married		3.0	P = 0.02%

M.A.F. According to Social Status

The broad categories of social status used for this study are thosecommonly used in General Practice (Eimerl T.S. 1969 p.136)

Social Class	Description
1	Professional
2	Intermediate
3	Skilled
4	Semi-skilled
5	Labouring

Male patients are ascribed to a class according to present employment or last employment, if retired. Women are ascribed to the appropriate class for their husbands, or according to their own employment if unmarried.

According to this method of allocation, the results of the present study are shown in Tables 18 and 19 for males, and Tables 20 and 21 for females.

The only significant deviation is found for men. A lower mean M.A.F. value is found for men in social group 5. As indicated in the Review of the Literature most previous observers have found no difference according to social class.

TABLE 18

DISTRIBUTION OF M.A.F. FOR EACH PRESCRIPTION ACCORDING TO THE SOCIAL STATUS OF THE PATIENT

MALES

POSSIBLE M.A.F.		0	1	2	3	4	5	6	7	8	9	10	11	12	Total
M.A.F. FOR SOCIAL GROUPS	1	2	1	0	0	0	0	0	0	1	0	1	0	0	5
	2	4	2	3	2	0	0	3	2	1	3	4	2	0	26
	3	16	6	7	5	3	18	6	11	8	7	3	8	2	100
	4	9	4	5	3	5	3	5	2	3	4	7	4	4	58
	5	12	10	11	6	8	13	4	5	3	4	3	5	2	86
TOTAL		43	23	26	16	16	34	18	20	16	18	18	19	8	275

TABLE 19

M.A.F. ACCORDING TO SOCIAL STATUS

MALES

Social Group		1	2	3	4	5	Total
No. of Prescriptions		5	26	100	58	86	275
		31					
Group M.A.F. Score	- Observed	19	143	519	324	375	1380
		162					
	- Expected	156		502	291	431	1380
Mean Group M.A.F.		5.2		5.2	5.6	4.4	5.0

$\chi^2 = 11.8$ DF = 3 1% > P > 0.1%

TABLE 20

DISTRIBUTION OF M.A.F. FOR EACH PRESCRIPTION ACCORDING TO THE SOCIAL STATUS OF THE PATIENT

FEMALES

POSSIBLE M.A.F.		0	1	2	3	4	5	6	7	8	9	10	11	12	Total
M.A.F. FOR SOCIAL GROUPS	1	5	0	0	1	0	2	0	0	0	0	0	0	0	8
	2	2	2	0	5	4	4	4	1	2	4	3	0	1	32
	3	35	20	14	17	16	14	12	11	9	6	14	13	1	182
	4	18	12	13	4	8	10	6	5	4	3	12	6	2	103
	5	20	10	10	13	9	14	1	5	8	9	6	6	0	111
TOTAL		80	44	37	40	37	44	23	22	23	22	35	25	4	436

TABLE 21

M.A.F. ACCORDING TO SOCIAL STATUS

FEMALES

Social Group		1	2	3	4	5	Total
No. of Prescriptions		8	32	182	103	111	436
		40					
Group M.A.F. Score	- Observed	13	172	803	472	487	1953
		185					
	- Expected	179		815	461	497	1952
Mean Group M.A.F.		4.6		4.4	4.7	4.4	4.5

$\chi^2 = 1.2$ DF = 3 P > 10%

Duration on List and M.A.F. (D.O.L.)

Tables 22 and 23 show the distribution by five-year intervals of the duration of registration of patients with the practice. Though patients with long-term illness could be expected to be older, it need not follow that they are also more settled geographically.

A very high proportion (93% men and 92% women) were found to be registered for longer than five years. The Tables of distribution indicate a high degree of geographical stability. This is probably more characteristic of the location of the practice, a Lancashire Mill town, than the nature of illness.

For men, there is a marginal betterment in the M.A.F. as the duration on list increases. For women, there does not seem to be any significant relationship.

This measurement has not been found previously reported in the literature.

TABLE 22

DURATION ON LIST AND M.A.F. - MALES

D.O.L. Interval	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55 +	Total
No. of R	18	39	22	37	34	11	19	11	18	34	29	3	275
											32		
M.A.F.	102	212	119	209	199	27	111	48	78	153	116	6	1380
											122		
MEAN	5.6	5.4	5.4	5.6	5.8	2.5	5.8	4.4	4.3	4.5	4.0	2.0	
											3.8		

χ^2 = 25.4 D.F. 10 1% > P > 0.1%

No. of patients on list 5 years or more = 173 = 93%

TABLE 23

DURATION ON LIST AND M.A.F. - FEMALES

D.O.L. Interval	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55+	Total
No. of R	30	74	35	51	99	14	40	22	17	21	18	15	436
											33		
M.A.F.	140	369	156	231	380	68	193	112	65	94	101	44	1953
											145		
MEAN	4.7	5.0	4.5	4.5	3.8	4.9	4.8	5.1	3.8	4.5	5.6	2.9	
											4.4		

χ^2 = 18.5 DF = 10 P = 5%

No. of patients on list 5 years or more = 428 = 92%

Duration of Diagnosis (D.O.D.)

The duration of diagnosis was determined for each illness for each patient according to the criteria described in the method.

A duration of diagnosis could thus be attributed to each item of prescription and to each M.A.F.

Tables 24 and 25 show the distribution of the number of prescriptions and total M.A.F. values for duration of diagnosis for males and females.

Males

The duration of diagnosis for men was distributed between 1 year and 52 years, being respectively asthma in a two-year old child and epilepsy in a man 69 years of age. The mean duration of all diagnoses for men is $\frac{2405}{216}$ = 11.1 years.

73% of the diagnoses were of longer duration than 5 years.

Table 24 shows the D.O.D. distribution of prescriptions and M.A.F. The tendency for mean M.A.F. to diminish with increasing D.O.D. suggests that longer established illness is associated with lower absolute measure of failure to comply with medicinal regimes.

Females

For women the range of the duration of diagnosis is from 1 year to 51 years, the older woman having had asthma since the age of 13. The mean duration of diagnosis for women is $\frac{3310}{381}$ = 8.7 years.

57% of the diagnoses were of a duration longer than 5 years.

As with men, there is a tendency for the mean M.A.F. measurement to diminish with the longer duration of diagnosis. This finding is not surprising and probably indicates that more advanced illness is associated with better compliance (Donabedian 1966: Chaves 1960), though Julia Watkins (1966) has shown that the longer a patient had had diabetes, the more errors were made in insulin administration.

TABLE 24

DURATION OF DIAGNOSIS

MALES

DISTRIBUTION OF PRESCRIPTIONS AND M.A.F. ACCORDING TO DURATION OF DIAGNOSIS

D.O.D. Intervals	0-4	-9	-14	-19	-24	25+	Total
No. of R	74	70	47	34	20	30	275
% R	26.9	25.4	17.1	12.4	7.3	10.9	100
M.A.F.	385	397	217	146	117	118	1380
% M.A.F.	27.9	28.8	15.7	10.6	8.5	8.5	100
MEAN M.A.F.	5.2	5.7	4.6	4.3	5.8	3.9	5.0

For No. of R v M.A.F.

$\chi^2 = 21.5$

DF = 5

$P < 0.1\%$

TABLE 25

DURATION OF DIAGNOSIS

FEMALES

DISTRIBUTION OF PRESCRIPTIONS AND M.A.F. ACCORDING TO DURATION OF DIAGNOSIS

D.O.D. Intervals	0-4	-9	-14	-19	-24	-29	30+	Total
No of R	185	114	50	44	16	10	17	436
% R	42.4	26.1	11.5	10.1	3.7	2.3	3.9	100
M.A.F.	904	521	195	193	36	49	55	1953
% M.A.F.	46.3	26.7	10.0	9.9	1.8	2.5	2.8	100
MEAN M.A.F.	4.9	4.6	3.9	4.4	2.2	4.9	3.2	4.5

For No. of R v M.A.F

$\chi^2 = 30.9$

DF = 6

$P < 0.1\%$

Distribution of M.A.F. According to Diagnosis made by Consultant or G.P.

Balint (1969. p.38) has shown that, from his observations, the larger majority of long-term repeat prescriptions were initiated by the General Practitioner. There may well be a difference between initial treatment and agreeing the diagnosis with the patient. In the present study the majority of illness was perceived by the patient to have a diaanosis agreed with a hospital Consultant.

Charney (1967) has reported that children are more likely to complete a course pf penicillin when prescribed by their personal doctor than when prescribed by a partner.

Davis (1968) showed that compliance with medicinal treatment was higher when patients sought the doctor's opinion, agreed with the doctor, or perceived the doctor's status to be significant.

Hospital doctors and General Practitioners are separate groups within the National Health Service.

It was expected that patients who recognised that the diagnosis was made by a hospital Consultant would have a lower M.A.F. value than patients who perceived that the General Practitioner had made the diagnosis.

The results show that for both men and women (Tables 26 and 27) there is no significant difference in M.A.F. according to who made the diagnosis.

This finding may be explained by the view that, for example, the rheumatoid patient who has pain will take tablets irrespective of who made the diagnosis.

Patients with long established illness may have an awareness of their clinical condition which reaches beyond the boundaries of doctor orientated diagnosis.

TABLE 26

DISTRIBUTION AND MEAN M.A.F. ACCORDING TO DIAGNOSIS MADE BY CONSULTANT OR GENERAL PRACTITIONER

MALES

M.A.F. Value	0	1	2	3	4	5	6	7	8	9	10	11	12	Total	Mean	SD
No. R Consultant	28	15	13	11	14	24	14	12	11	11	12	13	7	186		
No. R G.P.	15	8	13	5	2	10	4	8	5	7	6	6	1	89		
Total R	43	23	26	16	16	34	18	20	16	18	18	19	8	275		
Score Consultant	0	15	26	33	56	120	84	84	88	99	120	143	84	952	5.1	3.7
Score G.P.	0	8	26	15	8	50	24	56	40	63	60	66	12	428	4.8	3.7
														1380		

χ^2 (No. R Cons: v No. R G.P) = 7.97 DF = 11 P > 10%

Comparison of means (x) = 1.25 P > 10%

Proportion of all prescriptions associated with diagnosis by a G.P. = $\frac{89}{275} \times \frac{100}{1} = 32.4\%$

TABLE 27

DISTRIBUTION AND MEAN M.A.F. ACCORDING TO DIAGNOSIS MADE BY CONSULTANT OR GENERAL PRACTITIONER

FEMALES

M.A.F. Value	0	1	2	3	4	5	6	7	8	9	10	11	12	Total	Mean	SD
No. R Consultant	45	28	24	29	20	27	13	16	14	18	24	13	2	273		
												15				
No. R G.P.	35	16	13	11	17	17	10	6	9	4	11	12	2	163		
												16				
Total R	80	44	37	40	37	44	23	22	23	22	35	25	4	436		
												29				
Score Consultant	0	28	48	87	80	135	78	112	112	162	240	143	24	1249	4.6	3.6
Score G.P.	0	16	26	33	68	85	60	42	72	36	110	132	24	704	4.3	3.7
														1953		

χ^2 distribution (No. R Cons: v No. R G.P) = 10.38 DF = 11 P > 10%

Comparison of means (x) = 0.86 P > 10%

Proportion of total prescriptions associated with diagnosis made by G.P. = $\frac{163}{436} \times \frac{100}{1} = 37.4\%$

Dose of Drug per Day

Differences in the M.A.F. values according to the number of doses of drug per day are shown in Table 28

For single doses of drugs taken at night there is a significantly ($P = < 0.2\%$) low M.A.F. value showing that male and female patients who take hypnotics have a lower measured failure rate than patients who take drugs at other times and other frequencies.

From the observations of Gatley (1968) and Jenkins (1954) differences in failure related to increasing number of doses per day were anticipated.

For men it is clear that patients who require four doses a day have a statistically significantly higher M.A.F. value ($1\% > P > 0.2\%$) though differences for one, two or three doses have not been demonstrated.

For women the M.A.F. values for four and three doses vary from the mean for all women but the statistical significance is not as marked ($10\% > P > 5\%$)

Expressed as a percent compliance after the manner of Gatley, the following comparison can be made:-

Dose per day	1	2	3	4
Compliance %				
Gatley	67	50	44	22
This study	62	60	48	32

Both results would seem to suggest moderate differences. The more detailed analysis of the present study indicates a need for cautious interpretation.

TABLE 28

DISTRIBUTION OF M.A.F.
BY DOSE OF DRUG PER DAY

	O.N. DOSE		1 DOSE		2 DOSES		3 DOSES		4 DOSES	
NO. OF R.	M 21	F 54	M 41	F 71	M 42	F 59	M 152	F 201	M 11	F 30
TOTAL M.A.F. VALUE	60	147	231	278	176	233	794	1025	87	169
MEAN M.A.F. VALUE	2.9	2.7	5.6	3.9	4.2.	3.9	5.2	5.1	7.9	5.6
S.D.	2.6	2.5	3.8	3.6	3.2	3.5	3.4	3.7	3.2	3.6
Significance	P<0.2%	P<0.2%	P>10%	P>10%	P>10%	P>10%	P>10%	10%>P>5%	1%>P>0.2%	10%>P>5%

TOTAL NO: MALE = 267 (excluding Insulin, Cytamen,
FEMALE = 417 (Glyc. Triniti. and Migril.

TOTAL SCORE MALE = 1348 (Score excluded = 32)
FEMALE = 1852 (Score excluded = 101)

Significance is related to the overall mean M.A.F.of 4.5 for females and 5.0 for males

M.A.F. According to Number of Prescriptions

The relationship between the M.A.F. score and the number of items of prescription is shown in Tables 29 and 30.

There are marginal differences between the M.A.F. score for one prescription compared with two, for both men and women.

The differences are not as remarkable as previous reports suggest (Lipman 1965: Gatley 1968).

TABLE 29

M.A.F. ACCORDING TO NUMBER OF ITEMS OF PRESCRIPTION (MALES)

	1 ITEM	2 ITEMS	3 ITEMS	4 ITEMS	TOTAL
No. of Patients	114	55	13	3 (16)	186
No. of Prescriptions	114	110	39	12 (51)	275
Total M.A.F. Score	613	519	210	38 (248)	1380
Mean M.A.F.	5.4	4.7	5.4	3.2 (4.9)	
S.D.	3.6	3.4	3.9	2.7 (3.7)	

Mean 1 v Mean 2 (x) = 2.0 $5\% > P > 1\%$

Mean 1 v Mean 3 + 4 (x) = 0.9 $P > 10\%$

TABLE 30

M.A.F. ACCORDING TO NUMBER OF ITEMS OF PRESCRIPTION (FEMALES)

	1 ITEM	2 ITEMS	3 ITEMS	4 ITEMS	TOTAL
No. of Patients	156	99	22	4 (26)	281
No. of Prescriptions	156	198	66	16 (82)	436
Total M.A.F. Score	768	821	290	74 (364)	1953
Mean M.A.F.	4.9	4.1	4.4	4.6 (4.4)	
S.D.	3.5	3.2	3.4	3.9 (3.5)	

Mean 1 v Mean 2 (x) = 2.2 5% > P > 2%

Mean 1 v Mean 3 + 4 (x) = 1.2 P > 10%

Variations in M.A.F. for Multiple Prescriptions

Of the 461 patients included in the study, 196 had more than one item of prescription (71 male, 125 female), and of these 112 had a different M.A.F. value for separate items.

Tables 31 and 32 identify two groups of patients. One group had the same individual M.A.F. for each of their prescriptions; the other group had a different individual M.A.F. for each prescription.

The group which contained patients who had different M.A.F. values had a significantly higher group M.A.F. than the group of patients whose individual M.A.F. did not vary between prescriptions.

This suggests that patients who demonstrate a lower failure are also more consistent.

Of 71 male patients who had more than one prescription, 53 also had a different dose per day for each prescription. In 21 instances a higher M.A.F. value was found for the more frequent dose. In 21 instances there was no difference and in 11 instances the M.A.F. was lower for the more frequent dose.

85 of the 125 women who had more than one prescription also had a different dose for the separate prescriptions. In 28 instances the individual M.A.F. was higher for the more frequent dose; in 37 instances there was no difference and in 20 instances the M.A.F. was lower when the dose per day was more frequent (see Table 33)

TABLE 31

MULTIPLE PRESCRIPTIONS - MALES

COMPARISON OF PATIENTS WHO HAD SAME M.A.F. WITH PATIENTS WHO HAD DIFFERENT M.A.F.

	Patients with same M.A.F.	Patients with different M.A.F.	Total
No. of instances	25	46	71
% of instances	35%	65%	100%
No. of prescriptions	55	106	161
Total M.A.F.	153	595	748
Mean M.A.F.	2.8	5.6	
S.D.	2.6	3.1	

Comparison of means value = 7 $P < 0.2\%$

TABLE 32

MULTIPLE PRESCRIPTIONS - FEMALES

COMPARISON OF PATIENTS WHO HAD SAME M.A.F. WITH PATIENTS WHO HAD DIFFERENT M.A.F.

	Patients with same M.A.F.	Patients with different M.A.F.	Total
No. of instances	49	76	125
% of instances	39%	61%	100%
No. of prescriptions	107	173	280
Total M.A.F.	312	1017	1329
Mean M.A.F.	2.9	5.9	
S.D.	3.2	3.3	

Comparison of means value = 7.25 $P < 0.1\%$

TABLE 33

RELATIONSHIP BETWEEN MULTIPLE PRESCRIPTIONS AND DOSE PER DAY

MALES AND FEMALES

	M.A.F. higher for different doses	M.A.F. same for different doses	M.A.F. higher for less frequent dose	Total
No. of patients:-				
Male	21	21	11	53
Female	28	37	20	85
TOTAL	49 (35.5%)	58 (42%)	31 (22.5%)	138 = 100%

For more than two prescriptions only the difference between the lowest M.A.F. value and the other M.A.F. values has been included.

The amount of difference between each of two different prescriptions is shown, for women, in Table 34 and for men in Table 35.

The number of patients diminishes as the amount of difference between M.A.F. for the prescription increases.

The number of women patients involved at this level of the analysis permitted a comparison between differences in M.A.F. for the same and for differing illnesses. It is seen that the diminution in the number of patients according to the degree of difference between prescription M.A.F. values is independent of one or two diagnoses (Table 36).

This suggests that there is not a strong association between illness and variations in the M.A.F. for separate prescriptions.

TABLE 34

RANGE OF DIFFERENCES IN M.A.F. FOR MULTIPLE PRESCRIPTIONS

FEMALE

Difference in M.A.F. Value	0	1	2	3	4	5	6	7	8	9	10	Total
Frequency	49	18	19	11	10	9	4	7	2	4	2	135
% Frequency	36.3	13.3	14.1	8.2	7.4	6.7	2.9	5.2	1.5	2.9	1.5	100

Where three or more prescriptions are involved, only the differences between the smaller and each of the other M.A.F. values have been included.

TABLE 35

DIFFERENCES IN INDIVIDUAL M.A.F. FOR PATIENTS WITH TWO PRESCRIPTIONS

MALES

Amount of difference in M.A.F. of R1 and R2	0	1	2	3	4	5	6	7	8	Total
No. of patients	25	10	7	5	3	2	1	1	1	55

TABLE 36

DIFFERENCES IN INDIVIDUAL M.A.F. FOR PATIENTS WITH TWO PRESCRIPTIONS (FEMALES)

A. TWO PRESCRIPTIONS FOR SAME DIAGNOSIS

Amount of difference between M.A.F. of R1 and R2	0	1	2	3	4	5	6	10
No. of patients	18	6	5	2	3	2	1	1
					20			
				38				

B. TWO PRESCRIPTIONS FOR DIFFERENT DIAGNOSES

Amount of difference between M.A.F. of R1 and R2	0	1	2	3	4	5	6	7	8	9	11
No. of patients	22	7	6	7	6	3	1	4	2	2	1
						39					
					61						

C. TOTAL

Amount of difference between M.A.F. of R1 and R2	0	1	2	3	4	5	6	7	8	9	10	11
No. of patients	40	13	11	9	9	5	2	4	2	2	1	1

Total female patients with two diagnoses = 38+61 = 99

M.A.F. According to Patients' Illness

An attempt was made to determine the M.A.F. in relation to the illness of the patient. This was frustrated by the high proportion of patients with multiple prescriptions and the variation in the M.A.F. values for the individual prescriptions.

Consideration was given to using mean values of M.A.F. for multiple prescriptions and these values are included in the Tables of Appendix 1.

However, it became clear that the evaluation was unsatisfactory and for this reason the results in this area have been omitted. It was felt that more meaningful interpretation could be obtained from an analysis of compliance in relation to specific drugs rather than illness, and this aspect of the thesis has been more vigorously pursued.

The facility of a mechanical analyser could have permitted the exploration of the relationship between the M.A.F., illness and drug, considered together. At this level of analysis the limits of manual manipulation were reached.

Differences in M.A.F. According to Drug

Table 37 and Table 39 show the differeing values of M.A.F. for differing drugs for males and females.

The range of drugs included in the study is wide and samples which are 5 or smaller do not permit meaningful comparative analysis.

Tables 38 and 40 show the rank order of the mean M.A.F. values for samples over 5. Spearman's Test of Rank Correlation with size of sample shows that the variation in mean is independent of the size of the samples.

Males

Calculation of the comparison of means values showed that there is a significant (P = 5% or less) difference between mean M.A.F. of drugs including antacids and above, when compared with mean M.A.F. of drugs including anticonvulsants and below.

Females

For women, significant levels of difference emerged from comparison of means of antirheumatic and above with analgesics and below.

For women, it was also observed that differences could be found between the means of antirheumatic (e.g. indomethacin)

as against analgesics (e.g. aspirin). This would suggest that perception of effectiveness might need to be considered. (See Table 41).

A marginal difference was found between the mean of oral iron and cytamen. This does not lend strong support to the view that injections are associated with appreciably higher compliance (Feinstein 1959). A study of many more patients would be needed to clarify this area of compliance with treatment.

For both men and women it seems that prescriptions for oral antidiabetic drugs are less frequently omitted than prescriptions for clinitest tablets. For men, the statistical significance is of a high order. This finding suggests that patients who differentiate between two items of prescription may have reason for doing so and that testing urine is less important to the patient as a form of treatment compared with taking a drug.

For both men and women an impression is gained that drugs which might be regarded as important or effective, by the patient, tend to be associated with a lower M.A.F. value (Group B), than drugs located at the higher M.A.F. levels (Group A). It would, however, be inappropriate to draw statistical inference without evidence to show patients' beliefs. Such a study would be feasible using M.A.F. measurement to determine non-compliance.

The drugs listed in the following Tables have been ascribed a group title such as "diuretic" or individual names when the numbers involved are large. Descriptive names commonly used in General Practice have been adopted. For example "Englate" has been used rather than "Theophylline= Sodium Glycinate" and "Theograd" rather than "Theophylline". The specific names in the Tables are the same as those used on prescriptions.

"Iron" means oral iron preparations.

The practice of using proprietary names may not be evil.

Witness Sir Derrick Dunlop "Confession is Good for the Soul" - World Medicine March 7th 1973 - "Lastly over the years I have sometimes taught a good deal of nonsense. I regret for instance my passionate insistence that only generic drugs must be prescribed...." "....it is obviously dangerous to assume, as I used to do, that generically equivalent products are invariably of equal therapeutic potency to branded products".

TABLE 37

M.A.F. ACCORDING TO DRUG (MALES)

DRUG	NO. R	TOTAL M.A.F.	MEAN M.A.F.
Antirheumatic	16	115	7.2
Antacids	7	47	6.7
Analgesics	8	47	5.9
Antidepressants	6	37	6.2
Alupent	2	8	4.0
Antidiabetic	8	32	4.0
Anxiolytics	1	10	10.0
Antihypertensives	1	1	1.0
Aldomet	4	17	4.25
Anticoagulants	4	24	6.0
Anticonvulsants	13	56	4.3
Antibiotics	1	9	9.0
Antihistamines	3	17	5.7
Barbiturate (H.T.)	2	14	7.0
Barbiturate (Epil.)	2	10	5.0
Choledyl	15	70	4.7
Clinitest	7	61	8.7
Diuretics	25	125	5.0
Digitalis (Digoxin)	12	59	4.9
Englate	35	198	5.7
Ephedrine	19	85	4.5
Glyc. Triniti.	3	0	0
Hypnotics:-			
(Barbiturate)	10	25	2.5
(Largactil)	1	1	1.0
(Medomin)	1	0	0
(Mogadon)	6	25	4.2
(Welldorm)	1	2	2.0
Iron	3	24	8.0
Insulin	4	20	6.7
Migraine prep.	1	9	9.0

continued/

Probanthine	11	84	7.6
Steroids	7	24	3.4
Stilbestrol	2	12	6.0
Thyroid	1	4	4.0
Thyroxine	4	7	1.75
Vasodilators	21	76	3.6
Vitamins	1	0	0
Antiparkinsonism	4	14	3.5
Ismelin	1	0	0
Inderal	1	1	1.0
Atromid. S.	1	10	10.0
Lysivine	1	0	0
TOTAL	275	1,380	5.02

TABLE 39

RANK ORDER OF MEAN M.A.F. ACCORDING TO DRUG

SIZE OF SAMPLE PER DRUG MORE THAN 5

MALES

	DRUG	MEAN M.A.F.	RANK	SAMPLE SIZE	RANK	RANK DIFFERENCE	SD
A	Clinitest	8.7	1	7	14	13	3.2
	Probanthine	7.6	2	11	9	7	2.6
	Antirheumatic	7.2	3	16	5	2	2.4
	Antacids	6.7	4	7	14	10	3.1
	Antidepressants	6.2	5	6	16.5	11.5	2.9
	Analgesics	5.9	6	8	11.5	5.5	3.0
	Englate	5.7	7	35	1	6	2.2
	Diuretics	5.0	8	25	2	6	2.3
	Digoxin	4.9	9	12	8	1	3.0
	Choledyl	4.7	10	15	6	4	2.6
	Ephedrine	4.5	11	19	4	7	2.5
B	Anticonvulsants	4.3	12	13	7	5	2.8
	Mogadon	4.2	13	6	16.5	3.5	3.2
	Antidiabetic	4.0	14	8	11.5	2.5	2.9
	Vasodilators	3.6	15	21	3	12	2.4
	Steroids	3.4	16	7	14	2	3.3
	Hypnotics Barbit:	2.5	17	10	10	7	2.2

ONE FROM B v ONE FROM A $t = > 1.96$ $P = < 5\%$

$n = 17$ $\quad \sum D^2 = 863$

Correlation coeficient R does not differ significantly from 0 at the 1% level

The differences in mean M.A.F. values are therefore not related significantly to the size of the sample.

TABLE 38

M.A.F. ACCORDING TO DRUG (FEMALES)

DRUG	NO. R	TOTAL M.A.F.	MEAN M.A.F.
Analgesics	20	76	3.8
Antirheumatic	48	244	5.1
Antidiabetic (oral)	18	71	3.9
Anticonvulsants	9	34	3.8
Antihistamines	3	21	7.0
Aldomet	19	95	5.1
Antidepressants	15	72	4.86
Anticoagulants	2	10	5.0
Antacids	4	23	5.8
Anxiolytics	5	22	4.4
Hypnotics:-			
(Barbiturate)	18	40	2.3
(Doriden)	8	19	2.4
(Mogadon)	22	98	4.5
(Largactil)	5	13	2.6
(Medomin)	1	0	0
Choledyl	20	83	4.2
Englate	20	107	5.4
Cytamen	14	73	5.2
Codeine	1	1	1.0
Clinitest	8	45	5.75
Diuretics	39	156	4.0
Digoxin	6	18	3.0
Ephedrine preps.	13	41	3.2
Folic acid	1	9	9.0
Glyc. Triniti.	3	26	8.7
Iron (oral)	31	219	7.1
Insulin	1	4	4.0
Laxatives	2	0	0

continued/

Migraine prep.	3	22	7.3
Neomercazole	1	10	10.0
O.C. Pill	1	0	0
Phenobarb. (H.T.)	10	32	3.3
Phenobarb. Epilepsy	5	14	2.8
Steroids	2	13	6.5
Thyroid	7	20	2.86
Thyroxine	26	101	3.9
Vasodilators	19	91	4.8
Vitamins	4	27	6.8
Antiparkinsonism	1	1	1.0
Potassium	1	2	2.0
TOTAL	436	1,953	4.46

TABLE 40

RANK ORDER OF MEAN M.A.F. ACCORDING TO DRUG

SIZE OF SAMPLE PER DRUG MORE THAN 5

FEMALES

	DRUG	MEAN M.A.F.	RANK	SAMPLE SIZE	RANK	RANK DIFFERENCE	SD
A	Iron (oral)	7.1	1	31	3	2	2.6
	Clinitest	5.7	2	8	18.5	16.5	2.4
	Englate	5.4	3	20	7	4	3.0
	Cytamen	5.2	4	14	14	10	2.9
	Aldomet	5.1	5.5	19	9	4.5	2.7
	Antirheumatic	5.1	5.5	48	1	4.5	3.0
	Antidepressants	4.9	7	15	13	6	2.8
	Vasodilators	4.8	8	18	11	3	2.6
	Mogadon	4.5	9	22	5	4	2.8
	Choledyl	4.2	10	20	7	3	2.5
	Diuretics	4.0	11	39	2	9	2.7
	Antidiabetic (oral)	3.9	12.5	18	11	1.5	3.0
	Thyroxine	3.9	12.5	26	4	8.5	2.4
	Anticonvulsants	3.8	14.5	9	17	2.5	2.7
B	Analgesics	3.8	14.5	20	7	7.5	2.6
	Phenobarb: (HT)	3.3	16	10	16	0	2.9
	Ephedrine	3.2	17	13	15	2	2.8
	Digoxin	3.0	18	6	21	3	3.0
	Thyroid	2.9	19	7	20	1	2.4
	Doriden	2.4	20	8	18.5	1.5	2.4
	Hypnotic Barb:	2.3	21	18	11	10	2.3

ONE FROM B v ONE FROM A

$t = > 1.96$ $P = < 5\%$

$n = 21$ $D^2 = 676$

Correlation of Rank Difference:- R does not differ significantly from 0 at 1% level.

Differences in variation of mean M.A.F. is not related to sample size.

TABLE 41

DIFFERENCES BETWEEN MEANS FOR VARIOUS DRUGS

FEMALES

Drug	No. of R	Total M.A.F.	Mean M.A.F.	S.D.	Significance t	Significance P
Analgesics	20	76	3.8	2.6	2.6	2% < 1%
Antirheumatic	48	244	5.1	2.96		
Hypnotics:						
Barbiturates	18	40	2.3	2.3	1.1	> 10%
Mogadon	22	98	4.5	2.8		
Cytamen	14	73	5.2	2.9	2.2	5% < 2%
Oral Iron	31	219	7.1	2.6		
Oral Iron	31	219	7.1	2.6	6.8	< 0.02%
Barbit: Hyp:	18	40	2.3	2.3		—

Intermittent Failure of Compliance

The Charts of Appendix 2 show the distribution of the prescriptions which were not collected for the twelve-month duration of the study. From these Charts it is clear that the pattern is frequently an intermittent one.

Figure 14 shows this distribution for all M.A.F. values of 5 for males. That patients stop and start treatment in an almost rhythmic manner can be perceived.

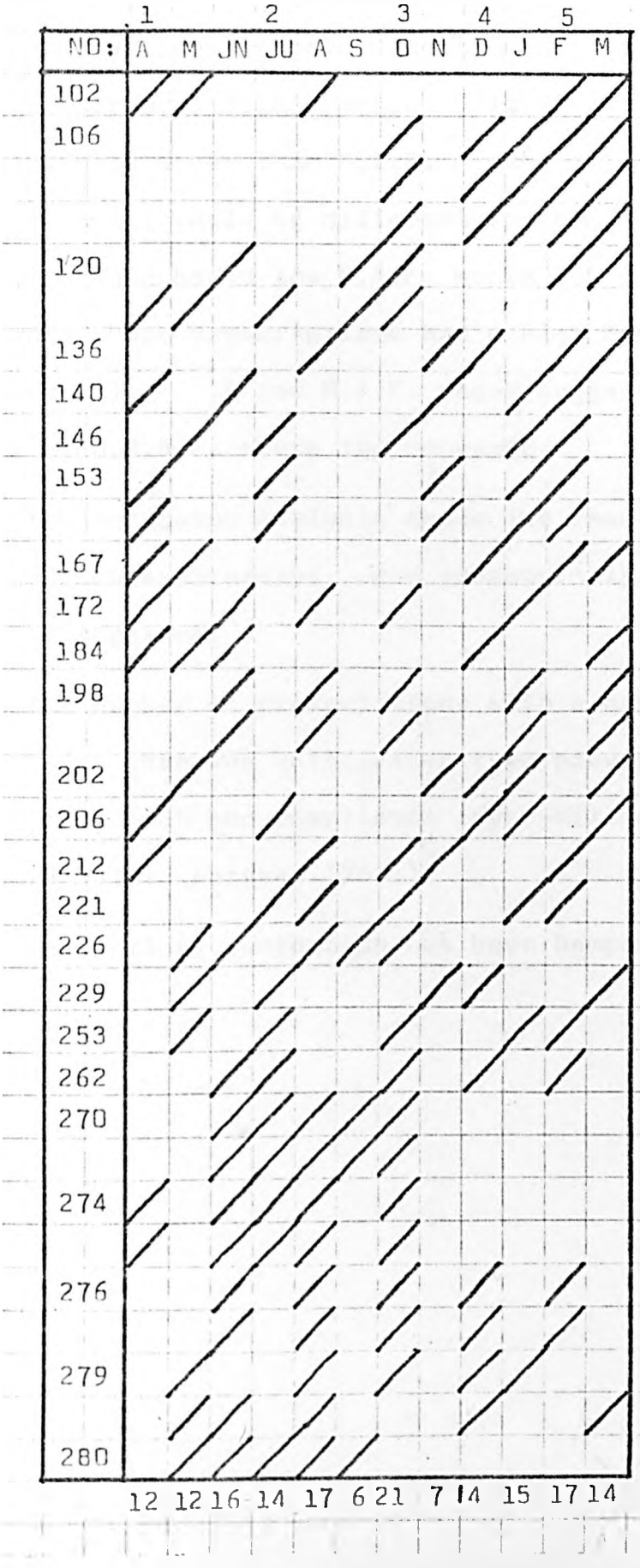
Some patients show prolonged periods of failure to collect prescriptions - e.g. patients 106 270 280, whilst others have a more dispersed failure - e.g. patients 146 153 212 and 229.

The Charts of Appendix 2 perhaps indicate more clearly the pattern of failure to collect prescriptions than any other measurement. From Figure 14 it can be seen that urine samples taken during different months would give differing estimates of non-compliance, and the larger the number of tests,the higher would be the amount of non-compliance (Wynn-Williams 1958).

FIGURE 14

DISTRIBUTION OF M.A.F. (MALES)

FIVE PRESCRIPTIONS NOT COLLECTED



Values of M.A.F. at the Ends of the Range of Rank Values

An analysis of the factors associated with extremes of M.A.F. values has been undertaken in the expectation that differences might emerge. It was anticipated that measurements other than M.A.F. - such as age, duration on list etc., would be different for patients whose prescriptions had a low M.A.F. score (0) as against patients whose prescriptions had a high M.A.F. score (11 and 12). A low M.A.F. score suggests high compliance and a high M.A.F. score the converse.

The following analysis shows the results for males and females separately; and subsequently for males and females together.

The number of prescriptions with a high M.A.F. score is smaller than was anticipated from previous studies, which show high non-compliance (Wynn-Williams 1958: Arnhold 1970: Bergman 1963.)

Statistical evaluation has been hampered by small numbers.

Characteristics of Low M.A.F. Prescriptions.

Patients who have an M.A.F. value of 0 could be described as highly compliant.

The characteristics of such patients according to the measurements included in the thesis are compared with the same characteristics for all prescriptions and shown in Table number 42 - derived from Appendix 1

For age, social status, duration on list (DOL), duration of diagnosis (DOD), and for diagnoses made by Consultant or G.P.., there are no remarkable differences.

For marital state, males show similarities, though the numbers in the sub-group are too small for statistical evaluation. For women, marital state is significant, married women having fewer (0) M.A.F. than single women, as compared with all prescriptions for women. This result is the more significant as it has already been shown that for all prescriptions for women, the married have a higher M.A.F. value.

There is also a reversal of the ratio of (0) M.A.F. according to type of drug compared with all prescriptions for women.

It would seem that, in terms of total compliance - (0 M.A.F.), married women appear to be the least compliant.

TABLE 42

CHARACTERISTICS OF PATIENTS WITH 0 M.A.F. PRESCRIPTIONS COMPARED WITH ALL PRESCRIPTIONS

1	AGE (mean)	0 M.A.F.	ALL PATIENTS
	MALE	58.1	51.0
	FEMALE	66.8	60.9

2	DOL (mean)	0 M.A.F.	ALL PATIENTS
	MALE	25.9	25.5
	FEMALE	24.3	22.5

3	DOD (mean)	0 M.A.F.	ALL PATIENTS
	MALE	12.8	11.1
	FEMALE	9.05	8.9

4	DIAGNOSIS MADE BY CONSULTANT (A) OR BY G.P. (B).	0 M.A.F.			ALL DIAGNOSES		
		A	B	Total	A	B	Total
	MALE:- No.	28	15	43	186	89	275
	Ratio	1.9 : 1			2.1 : 1		
	FEMALE:- No.	47	33	80	273	163	436
	Ratio	1.4 : 1			1.7 : 1		

DOL = DURATION ON LIST

DOD = DURATION OF DIAGNOSIS

continued/

5 TYPE OF DRUG (SEE TABLES on page

M/F	0 M.A.F.		ALL PRESCRIPTIONS	
	High Group A	Low Group B	High Group A	Low Group B
Male	5	10	41	67
Ratio	1 :	2	1 :	1.6
Female	14	32	140	82
Ratio	1 :	2.3	1.7 :	1

6 NUMBER OF DIAGNOSES

M/F	0 M.A.F.					ALL PATIENTS				
	1	2	3	4	Total	1	2	3	4	Total
Male:										
No.	30	13	0	0	43	158	26	2	0	186
%	69.8	30.2	0	0	100	84.9	14.0	1.1	0	100
Female:										
No.	36	40	4	0	80	193	78	8	2	281
%	45.0	50.0	5.0	0	100	68.7	27.7	2.8	0.7	100

8 MARITAL STATE

	0 M.A.F.				ALL PRESCRIPTIONS			
	S	M	W/D	Total	S	M	W/D	Total
MALE:-								
No.	5	37	1	43	36	218	21	275
%	11.6	86.0	2.3	99.9	13.1	79.3	7.6	100
FEMALE:-								
No.	20	37	23	80	61	267	108	436
%	25.0	46.2	28.8	100	14.0	61.2	24.8	100

χ^2 Female 0 M.A.F. v Female All Prescriptions = 51.2

DF = 2 $P < 0.1\%$

TABLE 42 (continued)

7 SOCIAL STATUS

M/F	0 M.A.F.						ALL PRESCRIPTIONS					
	1	2	3	4	5	Total	1	2	3	4	5	Total
MALE:-												
No.	2	4	16	8	13	43	5	26	100	58	86	275
%	4.7	9.3	37.2	18.6	30.2	100	1.8	9.5	36.3	21.1	31.3	100
FEMALE:-												
No.	6	3	34	19	18	80	8	32	182	103	111	436
%	7.5	3.8	42.5	23.8	22.5	99.9	1.8	7.3	41.7	23.6	25.5	100
TOTAL NO:	8 + 7 = 15		50	27	31		13 + 58 = 71		282	161	197	

χ^2 All Patients 0 M.A.F. V All Patients All Prescriptions = 0.69

DF = 3 P > 10%

Characteristics of High M.A.F. Prescriptions.

M.A.F. prescription values of 11 or 12 would suggest a very poor or total non-compliance with medicinal treatment.

The characteristics of such patients are compared with the characteristics of all patients for male and female in Table number 43 - derived from Appendix 1.

The numbers of measurements at this level of analysis are too small for statistical evaluation.

However, there are similarities in the characteristics throughout which would suggest that some other attribute of the patient needs to be considered. The patient's attitude and behaviour might be such a characteristic, and a solitary clue to this is found in the reversal of the ratio of the nature of the drug for males. Male patients with a high M.A.F. seem more frequently to take drugs which tend to have a high M.A.F. value for all patients.

Certainly these results would suggest that with larger numbers of patients, the M.A.F. measurement can be used to identify patients with very poor compliance and their characteristics could be more accurately defined and perhaps their attitudes measured.

TABLE 43

CHARACTERISTICS OF PATIENTS WITH HIGH M.A.F.PRESCRIPTIONS COMPARED WITH ALL PRESCRIPTIONS

(HIGH M.A.F. = M.A.F.OF 11 or 12)

1	AGE (mean)	HIGH M.A.F.	ALL PATIENTS
	MALE	53.2	51.0
	FEMALE	56.2	60.9

2	DOL (mean)	HIGH M.A.F.	ALL PATIENTS
	MALE	23.5	25.5
	FEMALE	24.2	22.5

3	DOD (mean)	HIGH M.A.F.	ALL PATIENTS
	MALE	10.3	11.1
	FEMALE	5.1	8.9

4	DIAGNOSIS MADE BY CONSULTANT (A) OR BY G.P. (B)	HIGH M.A.F.			ALL DIAGNOSES		
		A	B	Total	A	B	Total
	MALE:-						
	No.	19	8	27	186	89	275
	Ratio	2.4 : 1			2.1 : 1		
	FEMALE:-						
	No.	16	13	29	273	163	436
	Ratio	1.2 : 1			1.7 : 1		

CONTINUED/

5 TYPE OF DRUG (SEE TABLES

	HIGH M.A.F.		ALL PRESCRIPTIONS	
M/F	High Group A	Low Group B	High Group A	Low Group B
Male	8	6	41	67
Ratio	1.3 :	1	1 :	1.6
Female	13	7	140	82
Ratio	1.9 :	1	1.7 :	1

6 NUMBER OF DIAGNOSES

M/F	HIGH M.A.F.					ALL PATIENTS				
Male:	1	2	3	4	Total	1	2	3	4	Total
No.	22	4	1	0	27	158	26	2	0	186
%	81.5	14.8	3.7	0	100	84.9	14.0	1.1	0	100
Female:										
No.	22	7	0	0	29	193	78	8	2	281
%	75.9	24.1	0	0	100	68.7	27.7	2.8	0.7	100

7 SOCIAL STATUS

M/F	HIGH M.A.F.						ALL PRESCRIPTIONS					
	1	2	3	4	5	Total	1	2	3	4	5	Total
MALE:-												
No.	0	2	10	8	7	27	5	26	100	58	86	275
%	0	7.4	37.0	29.6	25.9	99.9	1.8	9.5	36.3	21.1	31.3	100
FEMALE:-												
No.	0	1	14	8	6	29	8	32	182	103	111	436
%	0	3.4	48.3	27.6	20.7	100	1.8	7.3	41.7	23.6	25.5	100

8 MARITAL STATE

	HIGH M.A.F.				ALL PRESCRIPTIONS			
	S	M	W/D	Total	S	M	W/D	Total
MALE:-								
No.	3	21	3	27	36	218	21	275
%	11.1	77.8	11.1	99.9	13.1	79.3	7.6	100
FEMALE:-								
No.	2	21	6	29	61	267	108	436
%	6.9	72.4	20.7	100	14.0	61.2	24.8	100

Men and Women Considered Together

At the extremes of the range of possible M.A.F. values, there are no startling differences according to age, social status, duration on list, duration of diagnosis, number of diagnoses, or whether the diagnosis was made by a Consultant or a G.P.

At the upper end of the range (M.A.F. 11 and 12) the nature of the drug is associated with a difference for men.

At the lower end of the range (M.A.F. 0), being married and the nature of the drug are associated with differences for women.

Effect of Increased Clinical Intervention

Two groups of patients were submitted to a surfeit of clinical intervention as described in the section on method.

Chronic Bronchitis Group

The tables in Appendix 6 show the detailed analysis of the differences between the amount of clinical intervention and M.A.F. values for the two groups of patients - those attending the special clinic and those who were not. It was anticipated that a greater show of "interest" in the patient might improve the level of the M.A.F.

One male and one female patient died during the period of observation and are excluded from the calculations.

A summary of the results is shown in Table 44 Compared with others, the patients in the clinic group made five times as many surgery attendances and had five times as many X-rays of chest, ten times as many haemoglobin tests and eight times as many vitalograph tests.

More acute episodes of bronchitis were perceived in the clinic group.

Despite the difference in the amount of clinical intervention, there is remarkable consistency in the M.A.F. values, which shows that there was no effect in the way these patients took medicinal treatment.

TABLE 44

EFFECT OF CLINICAL INTERVENTION ON M.A.F.

CHRONIC BRONCHITIS GROUP

		No. of patients	No. of R	M.A.F.	Mean M.A.F.	No. of Surg: Attend:	No. of Reminders	No. of Acute Bronchitis	No. of X-ray Chest	No. of Hb.	No. of Vitalograph
Clinic Group	M	30	34	173	5.09	327	70	31	33	35	325
	F	18	18	87	4.83	193	22	18	17	18	186
	Total	48	52	260	5.0	520	92	49	50	53	511
Others	M	30	35	169	4.83	83	0	19	7	3	42
	F	19	20	97	4.85	30	0	13	3	2	19
	Total	49	55	266	4.84	113	0	32	10	5	61

Comparison of the $\frac{FEVI}{FVC}\%$ for males in both the clinic and non-clinic groups show some betterment in the clinic, though both estimations of change are within the limitations of change encountered in patients with chronic bronchitis. The best that might be claimed is that two patients attending the special clinic were persuaded to stop smoking and this improved their Vitalograph performance.

There is no objective evidence therefore to suppose that the clinic patients derived particular benefit.

The result of the observation of the chronic bronchitis group of patients is a denial of the original hypothesis that increased clinical intervention changes objective measurements, particularly in relation to compliance with medicinal regimes of treatment.

Anaemia Group

Compared with others, the group of patients who attended the special clinic made five times as many surgery attendances and had eleven times as many haemoglobin estimations.

Detail of the analysis is contained in Appendix 6 and a summary is shown in Table 45.

Despite an increased amount of clinical intervention, there was no significant difference ($P > 20\%$) in the M.A.F. values of the two groups.

TABLE 45

EFFECT OF CLINICAL INTERVENTION

ANAEMIA GROUP

		No. of patients	No. of R	M.A.F.	Mean M.A.F.	No. of Surg: Attend:	No. of Reminders	No. of Hb.
Clinic Group	M & F	20	25	160	6.4	89	16	55
Others	M & F	19	26	172	6.6	17	0	4

Summary - Clinical Intervention

It would seem from the observation of this thesis that an imposed increase in clinical intervention does not improve the failure of compliance with medicinal treatment as measured by the prescription count and expressed as M.A.F.

The finding that a surfeit of clinical intervention does not affect compliance with medicinal regimes is suggested by the higher than average M.A.F. value (6) for males taking anticoagulants. These men attended fortnightly hospital clinics and suffered a relatively threatening illness - ischaemic heart disease.

Ritland and Lygren (1969) found that the number of patients at different mean Prothrombin - Proconcertin values were distributed among four groups as follows. over a three-month period:-

P P %

< 20	20 - 29.9	30 - 39.9	>40
28	50	19	4

This can be compared with the quartile distribution of total M.A.F. values found in the present study:-

12, 11, 10	9, 8, 7	6, 5, 4	3, 2, 1
664	967	847	438

Though the comparison is a crude one, it may be that under controlled trial conditions, knowledge of the M.A.F. values of patients attending anticoagulant clinics might well be useful in interpreting the response of the patients.

On the whole, the results of this part of the thesis are both disappointing and chastening. Certainly the findings are relevant to General Practice and perhaps also to some aspects of hospital practice.

It has not escaped my consideration that Professor Clarke may have anticipated the outcome of this part of the thesis when he suggested its inclusion.

Milton S. Davis (1968) has suggested that some patients make significant efforts in order to appear to comply with medical instruction.

Martin (1967) suggests that the better informed patient is more likely to comply with medical treatment. Mausner (1968) shows evidence that a persistent and positive approach can help smokers to stop smoking. From observations in General Practice, Porter states "The risk of drug defaulting may be reduced by making every effort to ensure that all patients understand instructions and are supervised frequently".

The present study shows that frequent supervision without drawing specific attention to drug therapy does not improve compliance. A difficulty arises in extending this part of the study. It is tempting to add some degree of pressure on the patient to collect prescriptions. The result might show a favourable response which could be interpreted to mean that the patient was more compliant or merely trying to show compliance.

Certainly, when the patient has no apparant need to demonstrate compliance, there is no significant decrease in measured non-compliance as a result of other clinical intervention.

New Patients Encountered During Period of Observation

During the course of the trial, 39 additional patients were encountered and who met the criteria for long-term illness described in this thesis. These patients were either new additions to the partnership list or patients for whom a need for long-term treatment was perceived for the first time.

Of these 39 patients, 28 (13 men and 15 women) were encountered during the first six months of the period of observation. Study record cards were prepared for them and their collection of prescriptions recorded. Between them there were 30 prescriptions. For the first six months of prescribing the total M.A.F. for these patients was 78 and the mean 2.6. Projected into a twelve-month period of observation, this would give a mean of 5.2, which compares with a mean of 4.9 for the major part of the study. This observation would suggest that failure to comply with medicinal treatment of long-term illness begins at an early stage and supports the finding in this thesis that duration of illness has only marginal effect on the measurement of M.A.F.

The number of new patients encountered was too small to allow a more detailed analysis.

At the end of the period of observation a questionnaire was administered to a random sample of 100 patients. The sample was selected using random sample tables (hence the three digit number for each patient).

The questionnaire sought to determine whether:-

a) Patients had been aware that their collecting of prescriptions was observed,

and

b) Patients could indicate if they failed to take medication and the frequency of failure.

The questionnaire is shown in Figure 15 and these were administered either by myself or by a receptionist.

The response to the questions is shown on subsequent pages but as indicated in the review of the literature considerable caution is needed in interpreting.

FIGURE 15

QUESTIONNAIRE

LONG-TERM PRESCRIBING STUDY

PATIENT STUDY NO: _____

NAME _____ DATE OF BIRTH _____

Question 1.

During the past twelve months have you failed to take your medicine or tablets from time to time? YES ☐ NO ☐

Question 2.

If 'YES' do you fail to take:-

	YES	NO
a dose at a time	☐	☐
for a day at a time	☐	☐
for a week at a time	☐	☐
for a month at a time	☐	☐
for more than a month at a time	☐	☐

Question 3.

Do you think that the doctor knows for certain that you fail to take some of your treatment? YES ☐ NO ☐

Response to Questionnaires.

Question 1.

Patients' response :	Number.	Number agreeing with study findings
YES	94	92
NO	6	6
	100	98

There was disagreement between the patients' claim and the response found in the study in so far as two patients who claimed that they did not omit treatment had M.A.F. values of 5 and (7 + 2) respectively.

Question 2.

Response of Patient	Number of Patients
Omit dose a day	45
Omit a day at a time	17
Omit a week at a time	11
Omit a month at a time	19
Omit over a month at a time	2

This finding would suggest that patients are aware of their failure and tend to vary their manner of compliance. It was not possible to validate their statements.

Question 3.

Response of Patient	Number of Patients
Doctor aware for certain of failure	7
Doctor not aware for certain of failure	93
	100

This finding would suggest that on the whole, patients were not aware of observation though some patients clearly felt that the doctor is aware of all that is happening to them.

SUMMARY OF RESULTS

SUMMARY OF RESULTS

The analysis of the results of the thesis shows that patients fail to collect almost 40% of prescriptions for long-term illness. Only 1.7% of patients failed to collect all possible prescriptions during the year of observation.

The selection of patients, consistent with the criteria of the study, has led to the exclusion of some patients with long-term illness whose needs or demands for medicinal treatment were intermittent or unreasonable. The patients included in the observations represented a hard core of geographically stable men and women who had well established and recognisable chronic illness. This factor, coupled with the understanding that the patients were unaware of the observation of their compliance with medicinal treatment, adds to the significance of the results.

The failure of the patients included in the study to collect prescriptions represents a saving of about 15% of the amount of drugs for which the National Health Service has a responsibility to meet the cost.

Seasonal variation in the failure to collect prescriptions has been demonstrated.

It seems likely that observations of long-term treatment need to continue for a year or longer if meaningful results are to be obtained.

Previous reports that the sex of the patient is unrelated to compliance is confirmed.

That compliance worsens with an increase in the number of items of prescription has been previously reported. This is confirmed.

With the exception of a lower failure to collect prescriptions by men in social group 5 previous reports of an absence of relationship between compliance and social status is confirmed,

From the results of the present study it would appear that the number of doses a day may not be as significantly related to compliance as has been previously reported. Drugs taken at night have a clear relationship with a low failure to collect prescriptions.

The age and marital state of the patient has previously been variously reported in terms of a relationship with compliance. From the present study, it would seem that married women, and women in the middle age group show a greater tendency to fail to collect prescriptions.

Previous reports that drugs administered by injection are associated with better compliance than oral preparations is not confirmed. This aspect of the study requires further exploration with larger numbers of patients.

Evaluation of the duration of registration with the "practice" and failure to collect prescriptions show that apart from a marginal betterment for men over longer periods, there is no significant relationship. This measurement can be readily made in General Practice and requires further enquiry.

It did not seem important to the patient in terms of collecting prescriptions whether the diagnosis was agreed with a Consultant or a General Practitioner.

For both men and women more prescriptions are collected in relation to longer duration of illness.

Patients who have multiple prescriptions show a marginal worsening in their collection of prescriptions. There is however, a consistency in so far as patients who collect most of their prescriptions tend to do so for all items of multiple prescriptions to the same degree. Patients who tend to fail to collect prescriptions show differences in their failure for differing prescriptions. The manner of failure is seen to be an intermittent one, for most patients, in a 'stop-go-stop' way.

Superimposed substantial clinical intervention by the doctor made no difference to the collection of prescriptions. This would suggest that patients determine their compliance

according to their own perceptions of need and that this need is not influenced by increased clinical intervention.

The nature of the drug is shown to have a significant relationship with collecting prescriptions. The 'more important' drugs being associated with a lower failure.

From the results it is apparent that being a busy housewife, having a long-standing illness, the time of year, and personal perceptions of need, as for hypnotics, are more significantly related to collecting prescriptions than the influence of the doctor or age or social class.

Certainly the significant factors encountered in this thesis are contained in those areas where the patient exercises control. This control is exercised in an intermittent or "self-titrating" manner.

DISCUSSION

DISCUSSION

The review of the literature shows that a number of methods have been used to estimate compliance with medical regimes of treatment.

The three principal methods described are:-

The Questionnaire Method:- (Mohler 1955: Feinstein 1959: Pitman 1959: Parkes 1962: Bergman 1963: Preston 1964: Park 1964: Leystyna 1966: Watkins 1966: Neeley 1968: Gibson 1968: Gordis 1969).

The Urine Testing Method:- (Simpson 1956: Dixon 1957: Leggatt 1957: Briete 1958: Wynn-Williams 1958: Chaves 1959: Velu 1960: Luntz 1960: Joyce 1962: Berry 1962: Bergman 1963: Preston 1964: Willcox 1965: Maddock 1967: Charney 1967: Gordis 1969: Johnston 1969: Porter 1969).

The Pill Counting Method:- (Feinstein 1959: Roth 1959: Ireland 1960: Velu 1960: Bergman 1960: Lipman 1965: Gatley 1968: Cliente 1969: Porter 1969: Libow 1970: Rickels 1970: Arnhold 1970: Roth 1970).

The method used in the present study is a count of prescriptions and is an extension of the pill counting technique. Unlike the three other methods described, the prescription count has no place in the measurement of short-term treatment. In terms of long-term illness however, the prescription count (M.A.F. count) has significant advantages, particularly in General Practice in the United Kingdom.

The method is simple, cheap and with careful recording, reliable results can be obtained.

Compliance with medicinal treatment has to do with patient behaviour (Cobb 1954: Davis 1968: Leary 1971: Elling 1960). Knowing that his or her medicinal treatment is being observed can affect patient behaviour (Jenkins 1954: Porter 1969: Silberstein 1966: Dixon 1957). The prescription count can be conducted without the patient being aware of any observation.

Previous observers have assumed that prescriptions which have been collected represent treatment taken by the patient (Gatley 1968: Porter 1969: Roth 1959: Nugent 1965). This assumption may not be true and a measurement of prescriptions which have not been collected is free of assumption and, in absolute terms, more accurate.

The unit of measurement used in this study - The Maximum Absolute Failure (M.A.F.) - represents a measurement at the level of the issue of prescriptions. It is recognised that some prescriptions collected by the patient may not be dispensed and, at the dispensing level, the M.A.F. measure might be different. Throughout the United Kingdom, offices are already established where dispensed prescriptions are received and costed (Cohen 1964). If it were possible for these "Pricing Bureaus" to keep special records of identifiable prescriptions for long-term treatment, then the M.A.F. measurement at the level of dispensing could be achieved nationwide.

Such a measurement could be used to determine National, Regional, and Local failure of compliance, and inter-practice variations as well as variations for different drugs. Such a service could be a service for the General Practitioner and the Hospital Consultant, which would in turn help the doctor to better understand his patient and perhaps improve the quality of care.

The possible value of such information to anti-coagulant clinics has been shown in this thesis (page 169 J.F. Cade(1970) and his colleagues have drawn attention to the changing anticoagulant needs of patients observed following open heart surgery. Whilst recognising that "many individual factors are responsible for changing anticoagulant needs", Cade was not able to identify failure of compliance in relationship with a need for increasing amounts of anticoagulant. The high standards of laboratory testing of anticoagulant activity in the United Kingdom (Editorial B.M.J. 1971) could be significantly augmented by a knowledge of the patient's failure to collect medication.

The M.A.F. Measurement has shown clearly that there is considerable variation between patients in their compliance with medicinal treatment, and that failure to collect prescriptions is dispersed over a range from the apparently wholly compliant (0 M.A.F) to the non-compliant (12 M.A.F.) The temptation to express the M.A.F. as a percentage (Gatley 1968) or as a calculated ratio, (Porter 1969) has been resisted. The simple M.A.F.

value of 5 out of 12 gives an indication both of the amount of failure and the duration of observation. The development of a standardised ratio may emerge as a result of further observations.

The M.A.F. Measurement has also permitted the identification of patients at both extremes of the range of compliance. In terms of commonly recorded variables, such as age, social status, marital state, and other measurements included in the thesis, such as duration of registration, duration of illness and who made the diagnosis - there does not seem to be any identifying characteric.

Being female and taking certain drugs are characteristics of patients who had 0 M.A.F. value. It has also been shown that patients with low M.A.F. values demonstrate more consistent behaviour in compliance with multiple prescriptions.

The opportunity is now presented to examine such patients more closely and to determine behaviour and attitudes in relation to compliance. Davis (1968) says about studies of compliance, that "most studies, however, focus on a population with a particular diagnosis, and comparative findings are few". With the exception of a few items of medication which cannot be accurately prescribed in monthly amounts, there is no other factor which limits the range of drugs which can be observed using the M.A.F. measurement.

In the review of the literature the influence of the side effects of drugs is indicated. It would be of interest to know if patients with a low M.A.F. score are more likely to suffer side effects or toxic effects of drugs. The combination of objective measurements of toxicity, such as the E.C.G. for digitalis intoxication (Schott 1969), and the M.A.F. score could form the basis of a useful investigation.

The recording card used in the present study has similar characteristics to record cards used by many General Practitioners in the United Kingdom. These cards could be used to provide continuous or intermittent evaluation of failure to collect prescriptions after the manner of morbidity recording in General Practice (Eimerl 1969). General Practitioners vary in their prescribing habits (Joyce 1967: Lee 1964: Linnett 1968). Such inter-doctor variation could be correlated with patient compliance.

The unanticipated finding of a possible seasonal variation in compliance requires further exploration. The M.A.F. measurement would permit this.

The result of the measurement of the effect of increased clinical intervention showed that the collection of prescriptions was unaffected. It was also observed that patients did not seem to vary their compliance in relation to their perception of whether a Hospital Consultant or a General Practitioner had made the diagnosis.

Previous reference to either of these two observations has not been found. It was the expectation that increased clinical intervention and an association with Consultant opinion would show higher M.A.F. values. When amphetamines were withdrawn from patients by me, there was some indication that greater difficulty was encountered when a Consultant had agreed the need (Lloyd 1973). Davis (1969) however, has shown that there is a significant difference between the doctor's expectation of his patient and what the patient actually does. Whatever benefit, if any, the patients received from an increase in clinical intervention, it was not reflected in the acceptance of medicinal treatment.

It is a humbling and sobering realisation that many hours of work may have contributed little to the health of the patient.

The overall failure to collect prescriptions (39.1%) has a close correlation with the average of previous reports using the urine test (37%) and pill counting method (42%).

Variations in the reported compliance using the urine testing method may be related to the number of tests, and the duration of observation - (See Table 2) Random measurements can produce misleading results because the urine test may not coincide with the recent ingestion of drug. The use of a single urine test has therefore to be deprecated on the grounds that compliance is not a constant feature in long-term illness and a single negative

test has little meaning in the evaluation of long-term illness.

Similarly, the work of this thesis supports the view held by Cliente (1969) in relation to the pill count that "an error of omission on one day balanced by an extra dose the next day would result in no recorded medication error if sampled at the end of day two".

A significant finding in the thesis is that there is a saving of 15% of drugs for which the National Health Service has responsibility to meet the cost. In terms of an annual expenditure of 166 million pounds for 1970, the saving is of the order of 25 million pounds. It could equally be argued that the amount of drug which a patient takes is proper in terms of good health and that dosages determined by drug trials are over-estimates.

From the results of the M.A.F. evaluation of compliance with medicinal treatment, the conclusion is inevitably reached that patients do determine their own treatment and are influenced to exercise their control by factors which are largely personal.

Over long periods, patients stop and begin treatment at will, and this behaviour can properly be described as "self-titrating".

It should be possible, using the M.A.F. method of recording, to determine much more about patient compliance with medicinal treatment over a wide range of parameters, and in varying populations.

The prescription count method provides the means of securing a standardisation of evaluation and a suitable basis for comparing the results of various studies.

GARETH LLOYD

1973

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APPENDIX 1

DETAILED TABLES - EXPLANATORY NOTES

COLUMN	CODE	EXPLANATION
1	NO:	Patient's Study Number.
2	M/S	Marital state:- S = Single M = Married W = Widowed There were no separated or divorced patients included.
3	S.S.	Social Status:- R.C.G.P. Group:- 1. Professional 2. Intermediate 3. Skilled 4. Semi-skilled 5. Labouring
4	AGE	-
5	D.O.L.	Duration on List:- Duration of registration with practice.
6, 12	D.C.	Diagnostic Code:- See List of illnesses in Appendix
7, 13	A/B	Diagnosis made by Consultant or G.P. :- A = Consultant B = G.P.
8, 14	D.O.D.	Duration of Diagnosis.

continued/

COLUMN	CODE	EXPLANATION
9, 10, 11	R1, R2, R3	Prescriptions 1, 2, 3, for first diagnosis.
15, 16, 17	R1, R2, R3	Prescriptions 1, 2, 3, for second diagnosis.
18, 19	1D, 2D	Number of Diagnoses made.
20, 21, 22, 23	1R, 2R, 3R, 4R	Number of Prescriptions per patient.
24	Mean	Mean value of prescriptions.

T.V. and T.N. in Column 1 mean total values and total numbers respectively. They were used as 'check' lists. In particular, T.N. values in columns 18 - 23 represent the sum of the T.V. values and were used for checking purposes only. They do not represent the total number of diagnoses or prescriptions in the combined columns.

APPENDIX 1 (MALES)

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
101	M	4	50	31	35	A	15	3			15	B	6	4				×		×			3.5
102	M	3	50	16	35	B	10	5									×		×				5.0
103	M	5	45	8	35	B	6	0									×		×				0
104	M	3	57	3	16	A	12	3			15	B	12	8				×		×			5.5
105	M	3	69	39	35	B	12	2									×		×				2
106	M	3	84	50	2	A	14	5	5		15	B	6	5				×			×		5
107	W	3	79	8	15	A	6	11									×		×				11
108	M	4	65	49	15	A	6	4									×		×				4
109	M	3	64	9	15	B	10	0									×		×				0
110	M	5	69	26	15	B	8	0									×		×				0
111	S	2	6	9	5	B	4	1									×		×				1
112	W	5	79	15	28	A	10	11									×		×				11
113	M	5	69	52	15	A	16	0									×		×				0
114	M	2	38	15	41	B	3	9									×		×				9
115	M	5	70	24	2	A	12	0									×		×				0
116	M	3	52	36	15	A	3	8									×		×				8
117	M	5	36	5	28	A	5	11									×		×				11
118	M	4	68	7	15	B	8	10									×		×				10
119	M	3	59	43	40	A	2	8									×		×				8
120	M	3	31	7	18	B	3	5			7	B	3	5				×		×			5
T.V.			1140	452			165	96	5				27	22			16	4	16	3	1		
T.N.			20	20	20	20	20	20	1		4	4	4	4			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
121	M	3	64	21	34	B	8	0			15	B	4	0				×		×			0
122	M	4	42	24	52	B	16	9									×		×				9
123	M	3	65	48	24	A	4	0			15	A	4	0				×		×			0
124	M	2	48	12	33	A	5	1									×		×				1
125	S	3	2	2	4	A	1	0									×		×				0
126	M	3	47	8	57	A	26	2									×		×				2
127	M	3	63	63	15	B	4	3									×		×				3
128	M	3	67	35	15	B	14	7									×		×				7
129	M	3	68	6	11	B	2	2									×		×				2
130	M	1	57	42	23	A	8	1									×		×				1
131	M	4	47	11	25	A	2	9	8	9							×				×		8.6
287	S	2	5	5	31	A	3	0									×		×				0
133	M	4	58	28	28	A	14	4									×		×				4
134	S	2	9	9	5	A	4	7									×		×				7
135	M	5	67	51	15	A	8	1	0	6							×				×		2.3
136	S	3	8	8	5	B	4	5									×		×				5
137	M	5	34	22	15	B	5	7									×		×				7
138	M	5	49	33	15	A	4	7									×		×				7
139	S	3	13	13	4	B	6	11									×		×				11
141	M	3	62	46	24	A	7	8									×		×				8
T.V.			875	487			145	84	8	15			8	0			18	2	16	2	2		
T.N.			20	20	20	20	20	20	2	2	2	2	2	2			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
142	M	3	71	17	15	B	17	2	9	7							×				×		6
143	M	3	69	52	1	A	11	0	0		35	B	13	0				×			×		0
144	M	4	72	42	15	B	3	1			2	A	14	1				×		×			1
145	M	4	56	24	5	B	10	2									×		×				2
146	M	3	57	41	2	A	4	5									×		×				5
147	M	3	77	15	45	A	11	8									×		×				8
148	M	5	74	51	15	B	16	3	5								×			×			4
149	M	5	46	24	15	B	5	11			31	A	33	11				×		×			11
150	M	5	71	41	2	B	16	4									×		×				4
151	M	3	61	11	8	A	10	0			35	B	16	0				×		×			0
152	W	5	78	38	16	B	21	2	2								×			×			2
153	M	5	75	13	16	A	8	5			15	B	2	5				×		×			5
154	S	2	3	3	5	B	2	3									×		×				3
155	M	5	67	50	41	B	6	7									×		×				7
156	M	3	63	46	34	A	8	1									×		×				1
157	S	3	14	6	4	B	12	11									×		×				11
158	M	3	58	27	15	B	9	2									×		×				2
159	M	3	63	5	15	B	5	0									×		×				0
160	M	5	50	20	15	A	4	2									×		×				2
161	M	3	76	24	33	B	4	11			51	B	23	11				×		×			11
T.V.			1201	550			182	80	16	7			101	28			14	6	11	7	2		
T.N.			20	20	20	20	20	20	4	1	6	6	6	6			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
162	S	5	57	11	2	A	4	3	1		35	B	2	1				×			×		1.6
163	M	3	71	49	15	A	16	6									×		×				6
164	M	4	52	35	28	A	12	10									×		×				10
165	W	5	80	50	33	A	21	4									×		×				4
166	S	2	9	9	4	B	6	11									×		×				11
167	M	4	70	33	18	A	2	6	8	5							×				×		6.3
169	M	2	61	46	35	A	4	0									×		×				0
170	M	2	54	2	15	B	4	6	10								×			×			8
171	M	3	80	32	1	A	18	11									×		×				11
172	M	5	66	18	51	B	42	8	5								×			×			6.5
173	W	5	60	40	28	A	26	4									×		×				4
174	M	4	70	46	8	B	12	12	6								×			×			9
175	M	5	63	24	51	A	22	12									×		×				12
176	M	3	47	21	25	A	8	9	12	9							×				×		10
288	M	4	59	26	25	A	6	2									×		×				2
178	M	3	66	17	1	A	10	10	11								×			×			10.5
179	M	5	61	34	33	A	7	2	1								×			×			1.5
180	M	4	65	6	15	B	5	10									×		×				10
181	S	5	41	21	15	B	7	7									×		×				7
182	W	5	62	16	15	A	3	0									×		×				0
T.V.			1194	536			235	133	54	14			2	1			19	1	12	5	3		
T.N.			20	20	20	20	20	20	8	2	1	1	1	1			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
183	M	5	66	2	15	A	2	3									×		×				3
184	M	5	68	46	35	A	14	5			2	A	8	3				×		×			4
185	M	4	49	33	15	B	3	9									×		×				9
289	M	3	71	19	15	B	3	6									×		×				6
187	M	3	65	46	24	A	23	9	9	8							×				×		8.6
188	W	5	78	48	15	B	3	9									×		×				9
189	M	3	44	4	28	A	16	12									×		×				12
190	M	3	78	51	15	B	18	0									×		×				0
191	M	5	51	13	31	A	40	4	9								×			×			6.5
192	S	4	23	16	7	A	6	10									×		×				10
193	M	3	66	25	44	A	15	3									×		×				3
194	M	4	60	24	15	A	5	12									×		×				12
195	M	3	54	18	23	A	8	7									×		×				7
196	M	4	85	52	25	A	30	10									×		×				10
197	M	4	79	51	1	A	5	0			51	B	17	0	0			×			×		0
198	M	3	69	43	35	A	23	5			25	A	23	5				×		×			5
199	M	2	74	8	33	A	20	10			38	A	50	9				×		×			9.5
200	M	4	67	46	2	A	15	2	1								×			×			1.5
290	M	4	65	15	23	A	7	11	12								×			×			11.5
202	M	3	71	5	15	B	11	5									×		×				5
T.V.			1283	565			267	132	31	8			98	17	0		16	4	12	6	2		
T.N.			20	20	20	20	20	20	4	1	4	4	4	4	1		20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO. OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
203	M	4	67	14	15	A	14	6									×		×				6
204	M	2	39	22	28	A	15	11									×		×				11
205	M	3	79	57	15	B	16	3									×		×				3
206	M	5	67	24	5	A	11	2	5								×			×			3.5
207	S	3	14	13	34	A	12	6									×		×				6
208	M	3	49	24	15	A	3	2									×		×				2
209	M	5	79	46	15	A	15	2	1								×			×			1.5
210	M	3	48	5	33	A	4	10									×		×				10
211	M	5	56	36	34	A	6	4									×		×				4
212	M	3	44	9	28	A	16	5									×		×				5
213	M	2	60	17	15	A	6	10			16	A	6	8				×		×			9
214	M	4	64	29	15	A	7	4									×		×				4
215	M	3	72	32	15	A	2	11									×		×				11
216	M	4	68	29	51	A	36	6									×		×				6
217	S	5	12	6	31	A	10	4	0								×			×			2
218	M	5	68	10	25	A	6	7	6								×			×			6.5
220	M	3	69	45	51	B	24	10			15	B	6	9				×		×			9.5
221	W	4	76	42	16	B	16	1			51	B	21	5				×		×			3
222	M	4	65	4	15	B	4	7									×		×				7
223	S	5	25	16	24	A	2	10	9								×			×			9.5
T.V.			1121	480			225	121	21			3	3	22			17	3	12	8			
T.N.			20	20	20	20	20	20	5		3	3	3	3			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
224	M	5	64	33	52	B	9	9									×		×				9
225	M	3	67	16	2	B	4	1									×		×				1
226	W	5	73	50	31	A	46	4	5								×			×			4.5
227	M	4	58	3	51	A	8	7									×		×				7
228	M	3	56	24	28	A	3	7	6								×			×			6.5
230	M	3	62	2	15	B	2	8									×		×				8
231	M	5	59	4	51	B	25	10									×		×				10
232	M	2	78	23	8	B	11	0									×		×				0
233	M	2	70	47	15	B	13	2									×		×				2
291	M	4	67	18	15	B	2	8									×		×				8
235	M	3	56	7	2	B	3	1									×		×				1
236	M	1	36	3	24	A	7	0	8		58	A	7	10				×			×		6
237	S	5	36	16	13	A	2	1									×		×				1
238	M	3	68	46	29	B	13	1	1								×			×			1
239	S	3	7	7	4	B	4	7									×		×				7
240	M	3	39	18	15	B	2	3									×		×				3
241	M	5	68	36	15	A	4	8									×		×				8
242	M	5	67	17	8	A	4	4	2								×			×			3
243	W	3	95	46	15	A	10	7			10	A	23	7				×		×			7
295	M	4	57	23	28	A	11	11	11								×			×			11
T.V.			1183	439			183	99	33				30	17			18	2	13	6	1		
T.N.			20	20	20	20	20	20	6		2	2	2	2			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
245	M	5	65	46	23	A	3	11									×		×				11
246	M	4	73	8	8	A	26	0	0								×			×			0
247	M	4	50	34	30	A	6	12									×		×				12
248	M	5	62	5	45	A	40	2									×		×				2
249	M	4	45	24	47	A	11	10			35	B	11	2				×		×			6
292	S	2	8	8	5	A	6	6									×		×				6
251	M	3	34	5	28	A	4	8									×		×				8
252	M	5	31	23	31	A	26	1	1								×			×			1
253	M	3	50	4	2	A	4	5									×		×				5
254	M	4	50	17	15	A	4	11									×		×				11
255	S	2	17	5	4	A	12	0	2								×			×			1
256	M	3	79	42	15	A	15	3									×		×				3
257	W	3	76	43	23	A	8	3									×		×				3
258	M	5	62	45	51	B	31	8									×		×				8
259	S	3	17	1	24	A	3	1									×		×				1
260	M	3	45	45	34	A	6	0									×		×				0
261	S	5	55	38	23	A	4	0	3								×			×			1.5
262	M	3	27	23	6	A	7	5									×		×				5
263	M	2	48	7	47	A	16	10									×		×				10
264	M	4	62	33	27	A	27	0	0								×			×			0
T.V.			956	456			259	96	6				11	2			19	1	14	6			
T.N.			20	20	20	20	20	20	5		1	1	1	1			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
265	M	5	64	41	41	B	7	2									×		×				2
266	W	5	78	51	16	A	8	1	1								×			×			1
267	M	3	80	7	41	A	24	7	7								×			×			7
268	W	3	84	8	2	A	20	4									×		×				4
293	M	5	68	52	33	A	8	2									×		×				2
270	M	5	30	18	20	A	6	5	5								×			×			5
271	M	1	61	5	35	B	20	0									×		×				0
272	S	5	69	29	31	A	52	4									×		×				4
273	M	5	50	34	25	A	6	6	6								×			×			6
274	S	5	23	22	31	A	16	5	5								×			×			5
275	M	5	74	51	35	B	13	0									×		×				0
276	M	3	74	47	1	A	5	5	5								×			×			5
277	M	3	77	22	5	A	32	0	0								×			×			0
294	M	2	67	15	28	A	8	6									×		×				6
279	M	3	62	50	33	A	3	7	5	5	35	B	3	2				×				×	4.75
280	M	5	67	51	15	B	3	2			28	A	22	5				×		×			3.5
281	M	4	52	25	28	B	18	0									×		×				0
282	M	4	74	28	15	B	7	2									×		×				2
283	M	5	67	46	15	B	3	7			2	A	7	9				×		×			8
284	M	4	68	6	51	A	27	3									×		×				3
T.V.			1289	608			286	68	34	5			32	16			17	3	10	9		1	
T.N.			20	20	20	20	20	20	8	1	3	3	3	3			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	^1D	^2D	^1R	^2R	^3R	^4R	
285	S	2	50	33	24	A	13	2	9								×			×			5.5
286	M	3	82	12	16	A	27	6	6								×			×			6
T.V.			132	45			40	8	15								2		2				
T.N.			2	2	2	2	2	2	2								2		2				

COL: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

NO:	M_S	S_S	AGE	DOL	DIAG: 1						NO: OF DIAG:	NO: OF R	MEAN SCORE
					DC	A_B	SCORE						
							R1	R2	R3	R4			
168	M	5	78	18	25	A	0	0	0	0	1	4	0
140	S	4	6	6	31	A	7	4	4	5	1	4	6.6

NO:	M_S	S_S	AGE	DOL	DIAG: 1				DIAG: 2				DIAG: 3				NO: OF DIAG	NO: OF R	MEAN SCORE
					DC	A_B	DOD	SCORE R1	DC	A_B	DOD	SCORE R1	DC	A_B	DOD	SCORE R1			
229	M	4	64	41	35	B	16	5	18	A	2	6	11	B	2	10	3	3	6.6
219	W	5	72	51	11	B	4	12	35	B	16	10	1	A	16	3	3	3	8.3

APPENDIX 1 (FEMALES)

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
401	W	3	68	19	15	B	3	0			11	B	1	3				×		×			1.5
402	M	5	47	22	35	B	11	2									×		×				2
403	W	4	86	23	33	B	2	4									×		×				4
404	S	5	69	34	35	B	9	5									×		×				5
405	M	5	61	7	15	B	4	4			41	B	4	0				×		×			2
406	M	3	64	33	30	A	5	0			35	A	21	1				×		×			0.5
407	W	3	70	30	34	A	9	3			15	A	4	3				×		×			3
409	M	5	61	6	23	A	4	7			34	A	8	7				×		×			7
410	S	3	57	27	35	B	14	0									×		×				0
411	M	2	38	6	31	A	28	7			11	B	2	7				×		×			7
412	W	4	66	33	35	B	11	0									×		×				0
413	M	3	59	24	34	A	6	3									×		×				3
414	W	3	71	38	6	A	10	10									×		×				10
415	M	3	59	36	33	A	6	1									×		×				1
416	M	3	49	7	51	A	19	11			11	B	1	11				×		×			11
417	M	3	76	19	4	A	12	0	8	8							×				×		5.3
418	M	3	64	22	34	A	7	0									×		×				0
419	S	4	80	56	33	A	21	0	0								×			×			0
420	M	4	72	14	35	A	12	0									×		×				0
421	M	5	50	33	5	A	9	5									×		×				5
T.V.			1267	489			194	62	8	8			41	32			13	7	11	8	1		
T.N.			20	20	20	20	20	20	2	1	7	7	7	7			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO. OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
422	M	3	79	6	35	B	21	0									×		×				0
423	S	4	70	13	51	B	24	0	0								×			×			0
424	M	3	68	51	21	B	20	0									×		×				0
425	M	4	69	23	12	A	5	10									×		×				10
426	M	3	73	23	25	A	8	7									×		×				7
427	M	3	51	23	57	A	12	0									×		×				0
428	M	5	69	24	25	A	2	0	0		15	B	3	0				×			×		0
429	M	2	51	15	16	A	4	9									×		×				9
430	M	3	61	6	35	B	11	0									×		×				0
431	S	5	81	19	2	B	19	0									×		×				0
433	M	3	51	34	31	A	36	1	1								×			×			1
434	W	3	66	23	34	B	6	1									×		×				1
435	M	4	62	23	16	A	6	0									×		×				0
436	W	3	60	45	35	B	13	6									×		×				6
437	M	3	44	8	57	B	2	1	2								×			×			1.5
438	M	3	66	30	35	B	2	0									×		×				0
439	W	2	79	2	8	A	16	10			12	A	3	9				×		×			9.5
440	M	3	71	5	51	B	18	4	7								×			×			5.5
441	S	4	75	5	51	A	30	1	5								×			×			3
442	M	4	72	56	2	A	5	11	12								×			×			11.5
T.V.			1317	434			260	61	27				6	9			18	2	12	7	1		
T.N.			20	20	20	20	20	20	7		2	2	2	2			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO. OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
443	M	3	49	13	15	A	3	10			51	A	16	3				×		×			6.5
444	M	4	52	16	16	A	10	5									×		×				5
445	M	3	52	5	35	B	14	10									×		×				10
446	M	3	61	15	35	B	17	2									×		×				2
447	W	4	73	23	51	A	25	0			28	B	4	7				×		×			3.5
448	M	3	61	8	23	A	5	10	10		33	A	11	10				×			×		10
449	W	3	76	19	35	B	13	0									×		×				0
450	W	3	77	22	35	B	3	11									×		×				11
451	W	3	81	5	35	B	16	6									×		×				6
452	M	4	65	32	33	A	8	12									×		×				12
453	W	3	78	22	34	A	8	2									×		×				2
454	M	4	84	18	2	A	17	0			35	B	30	0				×		×			0
455	M	4	80	23	31	A	5	7			34	A	13	2				×		×			4.5
456	M	4	74	8	2	A	6	0									×		×				0
457	W	5	72	39	2	A	4	4									×		×				4
458	M	3	51	11	3	A	4	5									×		×				5
459	M	3	51	7	51	B	1	1									×		×				1
460	M	3	75	34	7	A	5	5									×		×				5
461	M	3	47	4	54	A	16	2									×		×				2
462	M	3	37	13	15	B	2	4									×		×				4
T.V.			1296	337			182	96	10				74	22			15	5	15	4	1		
T.N.			20	20	20	20	20	20	1		5	5	5	5			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO. OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	^1D	^2D	^1R	^2R	^3R	^4R	
463	S	5	78	6	33	A	14	8	9								×			×			8.5
465	M	5	68	52	34	A	8	4			33	A	8	7				×		×			5.5
466	M	5	82	23	41	B	2	2									×		×				2
468	S	5	38	18	31	A	21	5									×		×				5
469	M	4	64	46	33	A	8	1			34	A	8	1				×		×			1
470	M	5	68	42	31	A	42	5									×		×				5
471	S	1	12	6	6	A	2	5									×		×				5
472	S	5	8	8	31	A	4	3	3								×			×			3
473	M	3	50	4	31	A	36	3	3								×			×			3
474	W	5	67	27	51	A	42	5									×		×				5
475	W	3	80	51	23	A	18	1			25	A	12	3	3			×			×		2.3
476	M	3	45	19	28	A	2	0									×		×				0
477	W	2	73	23	35	B	13	0			34	A	8	4				×		×			2
478	M	4	31	2	56	A	2	1									×		×				1
479	M	3	41	12	23	A	4	8	9								×			×			8.5
480	M	3	58	5	33	A	4	5									×		×				5
481	S	5	72	47	33	A	6	0									×		×				0
482	M	5	70	43	15	B	6	2									×		×				2
483	M	3	36	5	11	B	1	4									×		×				4
685	M	3	57	5	33	A	8	7									×		×				7
T.V.			1098	444			243	69	24				36	15	3		16	4	12	7	1		
T.N.			20	20	20	20	20	20	4		4	4	4	4	1		20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
485	W	5	70	7	33	B	4	1									×		×				1
486	M	3	56	23	33	B	11	0									×		×				0
487	M	4	52	36	23	A	8	2	7								×			×			4.5
488	M	5	62	23	23	A	4	3	5								×			×			4
489	W	2	67	18	16	A	3	6									×		×				6
490	M	3	74	33	33	A	6	3									×		×				3
491	M	5	68	45	35	B	2	8									×		×				8
492	M	5	65	25	52	B	12	2									×		×				2
493	M	1	39	12	57	B	23	3			38	B	2	0				×		×			5.5
494	W	5	69	53	51	A	10	0			11	A	0	9	9			×			×		6
495	M	2	55	14	34	A	4	5									×		×				5
496	S	2	7	7	4	B	4	1									×		×				1
497	W	4	60	7	13	A	14	8			35	B	18	10				×		×			9
498	S	4	5	5	4	B	3	0									×		×				0
499	W	3	87	7	1	A	6	0	0								×			×			0
500	S	5	84	14	12	B	1	8			11	B	1	10				×		×			9
501	M	5	73	3	35	B	8	5									×		×				5
502	M	5	64	24	4	A	51	1									×		×				1
503	S	3	2	2	5	A	0	2									×		×				2
505	S	2	4	4	5	B	2	5									×		×				5
T.V.			1063	362			176	63	12				21	29	9		16	4	13	6	1		
T.N.			20	20	20	20	20	20	2		4	4	4	4	1		20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO. OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
506	W	5	80	23	16	B	4	0			35	B	16	0				×		×			0
507	W	3	76	22	16	A	6	0			35	B	2	0				×		×			0
508	M	5	76	22	1	A	9	0			35	B	16	0				×		×			0
509	W	3	62	19	33	A	8	0			35	B	12	0				×		×			0
510	W	3	72	2	23	A	8	2									×		×				2
511	S	5	70	8	34	A	6	0			35	B	23	0				×		×			0
512	M	3	69	49	35	B	17	5									×		×				5
513	M	5	68	42	23	A	5	3			35	B	14	3				×		×			3
514	M	5	64	48	25	A	6	0									×		×				0
515	M	4	68	22	25	A	7	2									×		×				2
516	S	4	80	56	23	A	4	2	2								×			×			2
517	M	3	60	23	3	B	11	3									×		×				3
518	M	3	73	49	33	A	9	1	1								×			×			1
519	M	4	59	8	3	A	16	3									×		×				3
521	S	4	7	7	4	B	4	2									×		×				2
522	W	3	76	45	43	A	1	6	7		35	B	18	6				×			×		6.3
523	S	4	65	23	51	A	32	1			35	B	10	1				×		×			1
524	M	5	62	23	15	B	2	2									×		×				2
525	M	5	64	23	15	B	2	2									×		×				2
526	M	5	65	26	23	A	6	3			16	A	8	3				×		×			3
T.V.			1316	540			163	37	10				119	13			11	9	9	10	1		
T.N.			20	20	20	20	20	20	3		9	9	9	9			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO. OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	^1D	^2D	^1R	^2R	^3R	^4R	
527	S	2	52	36	33	B	4	5									×		×				5
528	W	3	60	32	15	B	2	5									×		×				5
529	M	3	77	16	33	A	7	5			51	A	16	5				×		×			5
530	M	3	79	46	15	B	2	1									×		×				1
531	W	4	75	42	12	A	1	0			11	A	1	0				×		×			0
532	M	4	52	16	33	A	3	10	10								×			×			10
533	M	3	74	23	7	A	18	8			35	A	18	0				×		×			4
534	M	3	62	22	34	A	4	1									×		×				1
535	M	3	74	1	12	A	10	1			11	A	5	10				×		×			5.5
537	M	3	69	39	33	A	7	9	7		52	B	2	6				×			×		6.5
538	M	3	39	18	34	A	6	3									×		×				3
539	W	3	73	23	11	B	1	2			35	B	14	1				×		×			1.5
540	M	5	71	54	15	B	4	5			35	B	16	5				×		×			5
541	M	3	77	22	15	B	3	4			35	B	22	3				×		×			3.5
542	M	3	42	10	33	A	10	4	4								×			×			4
544	M	3	55	13	34	A	8	0									×		×				0
545	M	3	61	45	15	A	16	3									×		×				3
546	M	4	72	14	51	A	8	0									×		×				0
547	W	3	64	33	51	A	21	1									×		×				1
548	W	3	50	34	15	B	6	5									×		×				5
T.V.			1278	539			143	72	21				94	30			12	8	10	9	1		
T.N.			20	20	20	20	20	20	3		8	8	8	8			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
549	M	3	50	34	51	A	18	5									×		×				5
550	S	4	77	24	51	A	26	2									×		×				2
551	W	4	63	12	51	A	22	4	3		35	A	17	3				×			×		3.3
553	M	5	68	10	15	B	2	1									×		×				1
554	M	5	68	25	15	A	3	1									×		×				1
555	M	4	68	24	51	A	29	4									×		×				4
556	M	4	69	35	51	A	33	2									×		×				2
558	W	4	76	26	15	B	16	4									×		×				4
559	M	4	50	23	15	B	3	4									×		×				4
560	M	2	54	7	15	A	5	4									×		×				4
562	W	3	63	7	51	B	10	1									×		×				1
563	S	5	66	16	57	B	3	1			35	B	3	1				×		×			1
564	M	5	47	22	15	B	4	2									×		×				2
565	M	3	71	12	15	B	2	0									×		×				0
566	M	3	36	13	11	B	1	5									×		×				5
567	W	5	72	22	23	A	5	9	9								×			×			9
568	M	3	67	23	34	A	8	0									×		×				0
569	M	2	71	22	41	B	8	3			35	B	17	10				×		×			6.5
570	W	5	82	18	35	B	24	8			52	B	12	2				×		×			5
571	M	3	52	4	15	B	2	1									×		×				1
T.V.			1270	379			216	61	12				49	16			16	4	15	4	1		
T.N.			20	20	20	20	20	20	2		4	4	4	4			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO. OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
572	S	5	57	19	34	A	6	1									×		×				1
573	W	4	78	40	23	A	3	0	0								×			×			0
574	M	2	56	17	35	B	9	6			16	A	5	4				×		×			5
575	M	3	53	23	34	B	2	2									×		×				2
576	M	2	54	18	51	A	6	4	3		11	A	2	10				×			×		5.6
577	W	3	77	2	33	A	16	3			48	B	1	4				×		×			3.5
578	M	4	57	24	55	A	0	10									×		×				10
579	M	5	51	16	11	B	2	11			12	B	2	0				×		×			5.5
580	S	4	74	46	11	B	2	10			12	B	2	1				×		×			5.5
581	M	3	43	19	38	B	6	11									×		×				11
582	W	2	77	4	33	A	8	3	3		34	A	3	3				×			×		3
583	M	3	65	39	51	B	4	2	2								×			×			2
584	M	3	66	9	28	A	2	11									×		×				11
585	M	5	69	18	41	B	5	4	4								×			×			4
586	M	4	49	29	51	A	28	6	6								×			×			6
587	M	3	75	5	34	A	7	2									×		×				2
588	M	5	58	42	34	A	9	4									×		×				4
589	M	3	79	9	35	B	15	5			11	B	1	8				×		×			6.5
590	M	2	42	28	38	A	27	8									×		×				8
591	W	4	75	5	51	A	19	3			16	A	4	0				×		×			1.5
T.V.			1255	412			176	106	18				20	30			12	8	8	10	2		
T.N.			20	20	20	20	20	20	6		8	8	8	8			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
592	M	3	37	11	57	A	6	11									×		×				11
593	W	5	72	9	33	A	5	4									×		×				4
594	S	5	73	56	33	B	16	0									×		×				0
595	M	3	56	19	57	B	3	10									×		×				10
596	W	4	68	23	25	A	9	5	5		41	B	3	8				×			×		6
597	M	2	77	22	35	B	16	1			33	B	10	3				×		×			2
598	M	5	51	19	33	B	2	0									×		×				0
599	W	3	77	44	35	B	16	1			51	B	4	9				×		×			5
600	M	2	31	9	57	B	1	9									×		×				9
601	M	3	63	34	33	B	5	0									×		×				0
602	W	3	67	28	11	A	3	4			12	A	3	8				×		×			6
603	S	1	76	12	2	A	4	0	0		8	A	4	0				×			×		0
604	M	3	40	8	49	A	3	11									×		×				11
605	M	1	61	33	15	B	2	0			35	B	16	5				×		×			2.5
606	M	4	69	22	33	A	6	11									×		×				11
607	S	4	10	10	5	A	4	9									×		×				9
608	W	5	78	44	41	A	6	11	11								×			×			11
610	W	4	66	46	33	A	5	5									×		×				5
611	M	5	71	23	35	B	10	5			51	B	10	5				×		×			5
T.V.			1143	472			122	97	16				50	38			12	7	11	6	2		
T.N.			19	19	19	19	19	19	3		7	7	7	7			19		19				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO. OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
612	W	5	70	1	34	A	6	5									×		×				5
613	M	3	68	39	12	A	6	1			11	A	2	8				×		×			4.5
614	M	4	64	35	16	A	5	6			15	A	5	2				×		×			4
615	M	3	50	9	41	B	2	10									×		×				10
616	M	3	36	3	2	A	11	10									×		×				10
618	W	4	78	23	37	B	2	11									×		×				11
619	M	3	47	32	11	B	1	4			47	A	16	4	5			×			×		4.3
620	M	5	62	36	33	A	19	9			8	A	7	11				×		×			10
621	M	2	40	8	34	A	4	9									×		×				9
622	M	5	64	37	23	A	5	1			15	B	2	3				×		×			2
623	M	3	50	34	12	A	8	6			11	A	2	7				×		×			6
624	S	3	9	9	34	A	8	6									×		×				6
625	S	2	8	8	4	A	4	12									×		×				12
626	M	3	46	3	11	B	1	11									×		×				11
627	M	4	40	24	51	B	2	11									×		×				11
628	M	3	39	17	9	A	2	8									×		×				8
629	M	3	30	6	49	B	2	12									×		×				12
630	M	3	59	23	48	A	2	10									×		×				10
631	S	4	70	46	15	B	4	6									×		×				6
632	M	3	79	49	15	B	2	11									×		×				11
T.V.			1009	442			96	159					34	35	5		14	6	14	5	1		
T.N.			20	20	20	20	20	20			6	6	6	6	1		20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
633	M	3	61	13	51	B	6	9									×		×				9
634	M	4	50	32	15	B	6	6									×		×				6
635	M	4	64	6	15	B	2	11									×		×				11
636	M	4	58	20	51	B	8	5	1								×			×			3
637	M	5	67	15	2	A	7	3	2								×			×			2.5
638	W	3	72	56	1	A	14	4	1								×			×			2.5
639	M	5	35	13	12	A	1	8			11	A	1	10				×		×			9
640	S	4	46	34	27	A	1	6			35	A	12	10				×		×			8
642	S	3	72	55	23	A	4	0	0		11	B	1	0				×			×		0
643	W	4	74	12	51	A	38	7									×		×				7
644	M	3	54	17	39	A	8	5	11								×			×			8
645	M	3	63	46	33	A	10	9									×		×				9
646	M	4	63	12	41	B	4	4	4								×			×			4
648	M	3	68	22	33	A	13	0			35	A	17	0				×		×			0
649	S	5	75	56	7	A	4	1			35	A	27	1				×		×			1
650	W	5	77	42	33	A	16	0			35	B	21	0				×		×			0
651	W	2	76	4	33	A	10	0			35	B	12	4				×		×			2
652	M	5	45	19	31	A	37	6	2								×			×			4
653	M	5	31	8	34	A	6	3			21	B	2	0				×		×			1.5
654	S	2	64	48	11	A	2	6									×		×				6
T.V.			1215	530			197	93	21		93			25			12	8	6	13	1		
T.N.			20	20	20	20	20	20	6		8	8	8	8			20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
655	S	3	27	12	31	A	15	0	2								×			×			1
656	M	5	39	15	11	B	1	9			34	A	8	9				×		×			9
657	M	5	61	24	52	B	4	10			25	A	2	10				×		×			10
658	M	5	62	22	34	A	6	4			23	A	6	4	11			×			×		6.3
659	M	3	38	4	57	B	4	4			35	B	10	3				×		×			3.5
660	M	5	75	22	51	A	18	8									×		×				8
661	M	5	49	33	51	B	4	11									×		×				11
662	M	3	41	8	6	A	4	6									×		×				6
663	M	3	32	4	57	A	3	9									×		×				9
664	W	2	65	14	51	A	22	8									×		×				8
665	M	3	76	29	15	B	3	11									×		×				11
666	M	5	73	57	51	A	41	10									×		×				10
667	W	4	80	22	15	B	3	10									×		×				10
668	W	3	76	4	23	A	1	5	5	10							×				×		6.6
669	M	4	49	33	11	B	1	10									×		×				10
671	W	3	78	18	11	B	1	11									×		×				11
672	W	3	72	4	12	A	4	4									×		×				4
673	M	2	75	23	15	B	2	6									×		×				6
674	M	4	51	36	11	B	1	8									×		×				8
675	M	3	52	36	33	B	2	6									×		×				6
T.V.			1171	420			140	150	7	10			26	26	11		16	4	14	4	2		
T.N.			20	20	20	20	20	20	2	1	4	4	4	4	1		20		20				
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

NO:	M_S	S_S	AGE	DOL	DIAG: 1			Score			DIAG: 2			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
676	M	3	47	16	15	B	10	6									×		×				6
677	M	5	73	32	51	B	9	7			34	B	2	4				×		×			5.5
678	M	3	38	10	11	B	1	8									×		×				8
679	M	3	46	32	15	B	3	10									×		×				10
680	W	2	78	22	33	A	9	6									×		×				6
682	M	3	67	27	41	B	2	7									×		×				7
683	W	4	67	17	12	A	4	9									×		×				9
684	M	5	65	34	15	A	10	10									×		×				10
686	M	3	60	22	51	A	18	4			34	A	6	6				×		×			5
687	M	5	72	32	2	A	8	8	9								×			×			8.5
688	W	3	61	44	5	A	4	7	9								×			×			8
689	W	3	87	20	1	A	27	5	10								×			×			7.5
T.V.			761	308			105	87					8	10			10	2	7	5			
T.N.			12	12	12	12	12	12	3		2	2	2	2			12		12				

COL: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

NO:	M_S	S_S	AGE	DOL	DIAG: 1 to 3			Score			DIAG: 2 to 4			Score			NO.OF DIAG:		NO. OF PRESCRIPT:				MEAN
					DC	A/B	DOD	R_1	R_2	R_3	DC	A/B	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
467	M	4	53	9	4	A	40	2			11	A	2	2									
					12	A	2	2															
484	W	3	78	23	33	A	12	10			34	A	8	11									
					51	A	2	2			2	A	12	2									
504	S	3	75	16	12	A	6	3			23	A	6	1									
					41	B	2	8															
552	M	4	66	50	34	A	10	7			7	A	6	7									
					35	A	18	10															
543	M	3	76	32	11	A	2	7			12	A	2	4									
					16	A	9	5	2														
609	M	4	65	6	15	A	4	1			16	A	4	1									
					35	A	10	1															
647	S	4	69	52	33	A	4	11			15	B	2	10									
					50	B	2	5			29	B	2	5									
670	W	5	60	8	34	A	6	5			12	A	3	7									
					51	A	10	3															
681	M	3	70	23	33	A	8	0			53	A	4	0	0								
					21	B	10	0															
690	M	5	50	23	52	B	2	5			35	B	16	3									
					11	B	1	8															
T.V.			662	242			160	95	2				67	53	0								
T.N.	10	10	10	10	20	20	20	20	1		12	12	12	12	1								
COL:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

APPENDIX 2

DETAILED CHARTS OF PRESCRIPTIONS

CHARTS OF M.A.F. DISTRIBUTION - EXPLANATORY NOTES

COLUMN	CODE	EXPLANATION
1	NO:	Patient's Study Record Number.
2	SCORE	Individual prescription M.A.F. score

The remaining twelve columns represent the prescriptions not collected according to month.

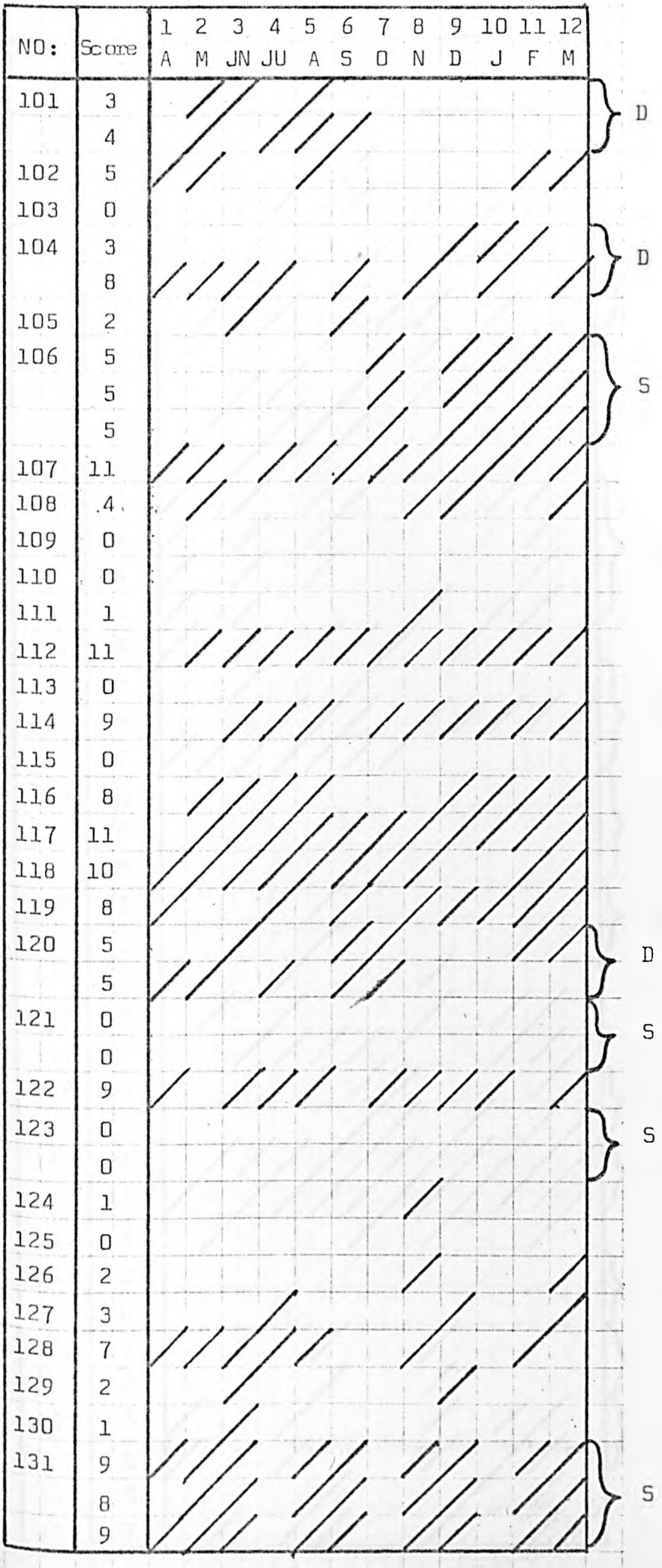
APPENDIX 2 (MALES)

DETAILED CHARTS OF PRESCRIPTIONS

APPENDIX 2

MALES

Distribution of Prescriptions which were NOT COLLECTED



APPENDIX 2

MALES

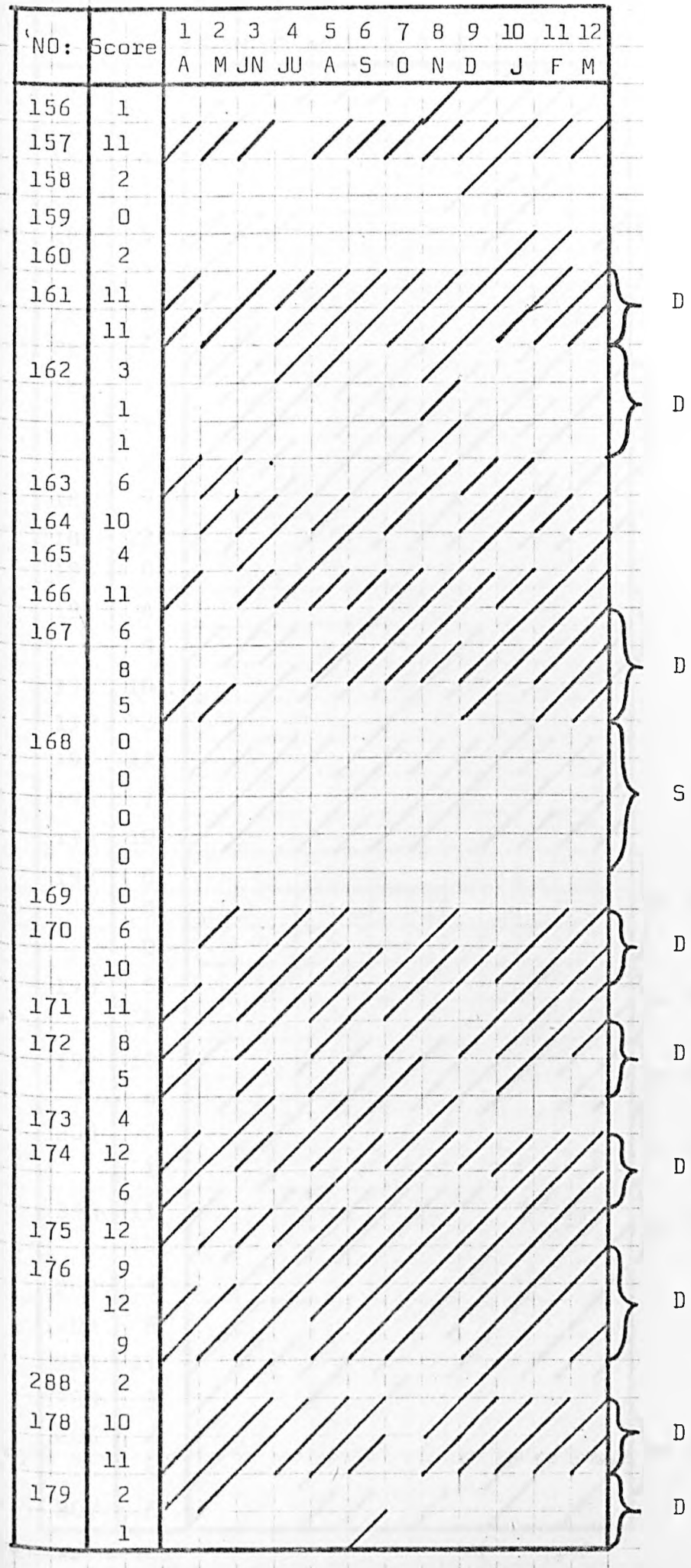
Distribution of prescriptions which were NOT COLLECTED

NO:	Score	1 A	2 M	3 JN	4 JU	5 A	6 S	7 O	8 N	9 D	10 J	11 F	12 M	
287	0													
133	4													
134	7													
135	1													D
	0													
	6													
136	5													
137	7													
138	7													
139	11													
140	7													
	4													D
	4													
	5													
141	8													
142	2													
	9													D
	7													
143	0													
	0													S
	0													
144	1													
	1													S
145	2													
146	5													
147	8													
148	3													
	5													D
149	11													
	11													D
150	4													
151	0													
	0													S
152	2													
	2													S
153	5													
	5													S
154	3													
155	7													

APPENDIX 2

MALES

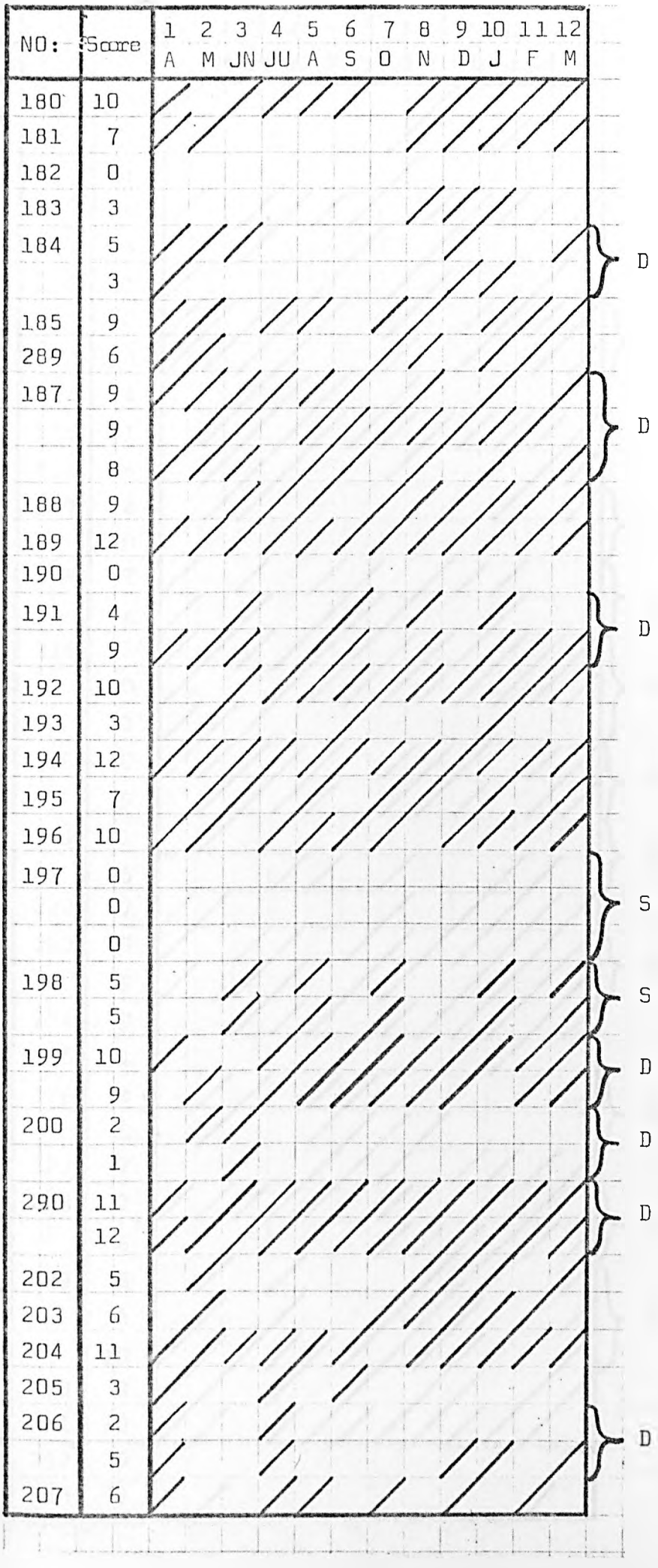
Distribution of prescriptions which were NOT COLLECTED



APPENDIX 2

MALES

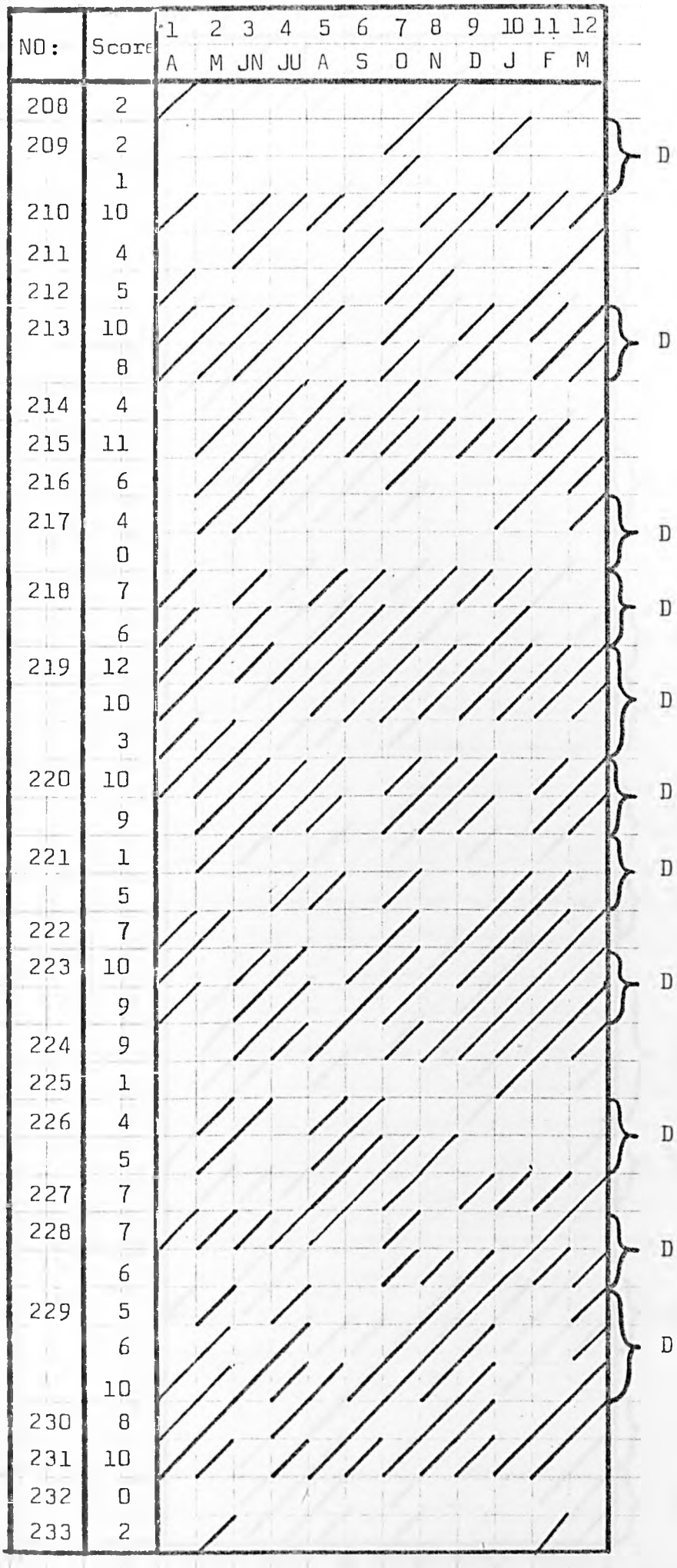
Distribution of prescriptions which were NOT COLLECTED



APPENDIX 2

MALES

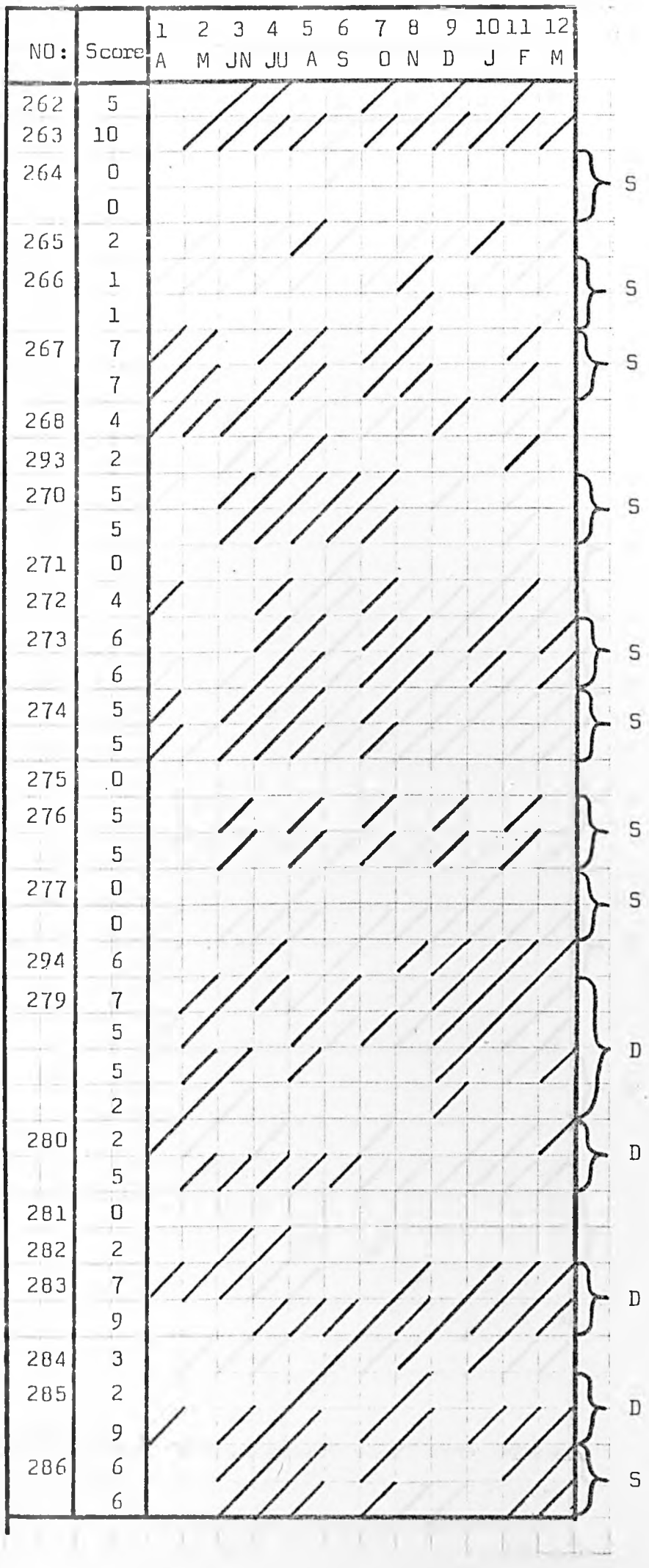
Distribution of prescriptions which were NOT COLLECTED



APPENDIX 2

MALES

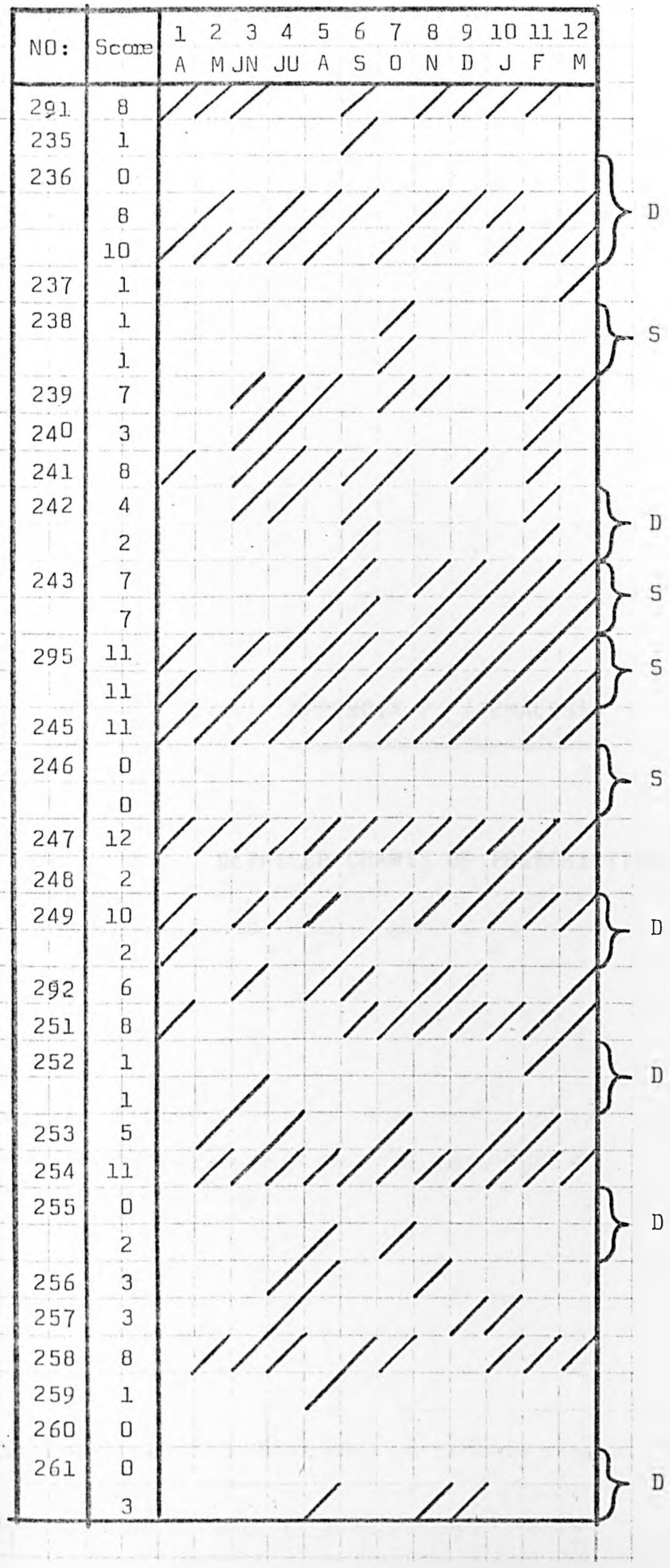
Distribution of prescriptions which were NOT COLLECTED



APPENDIX 2

MALES

Distribution of prescriptions which were NOT COLLECTED



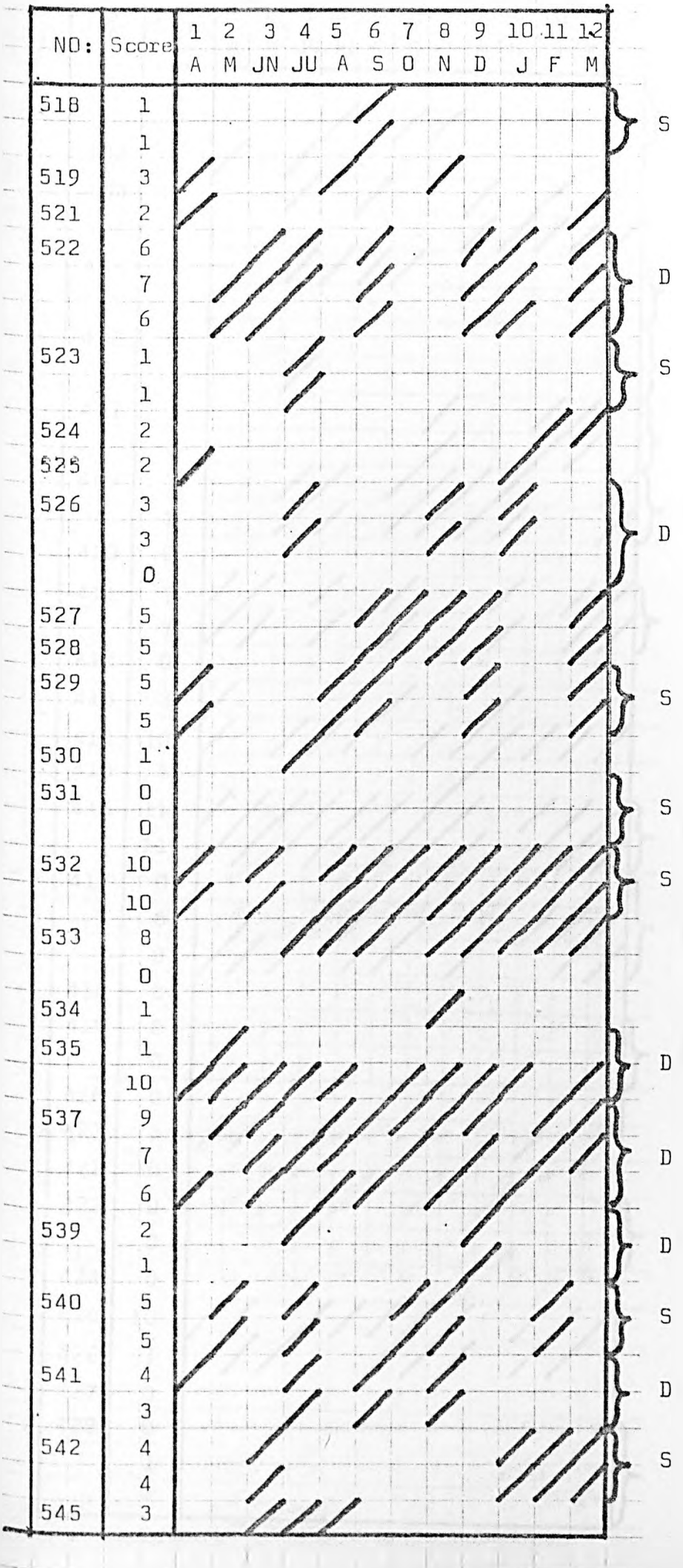
APPENDIX 2 (FEMALES)

DETAILED CHARTS OF PRESCRIPTIONS

APPENDIX 2

FEMALES

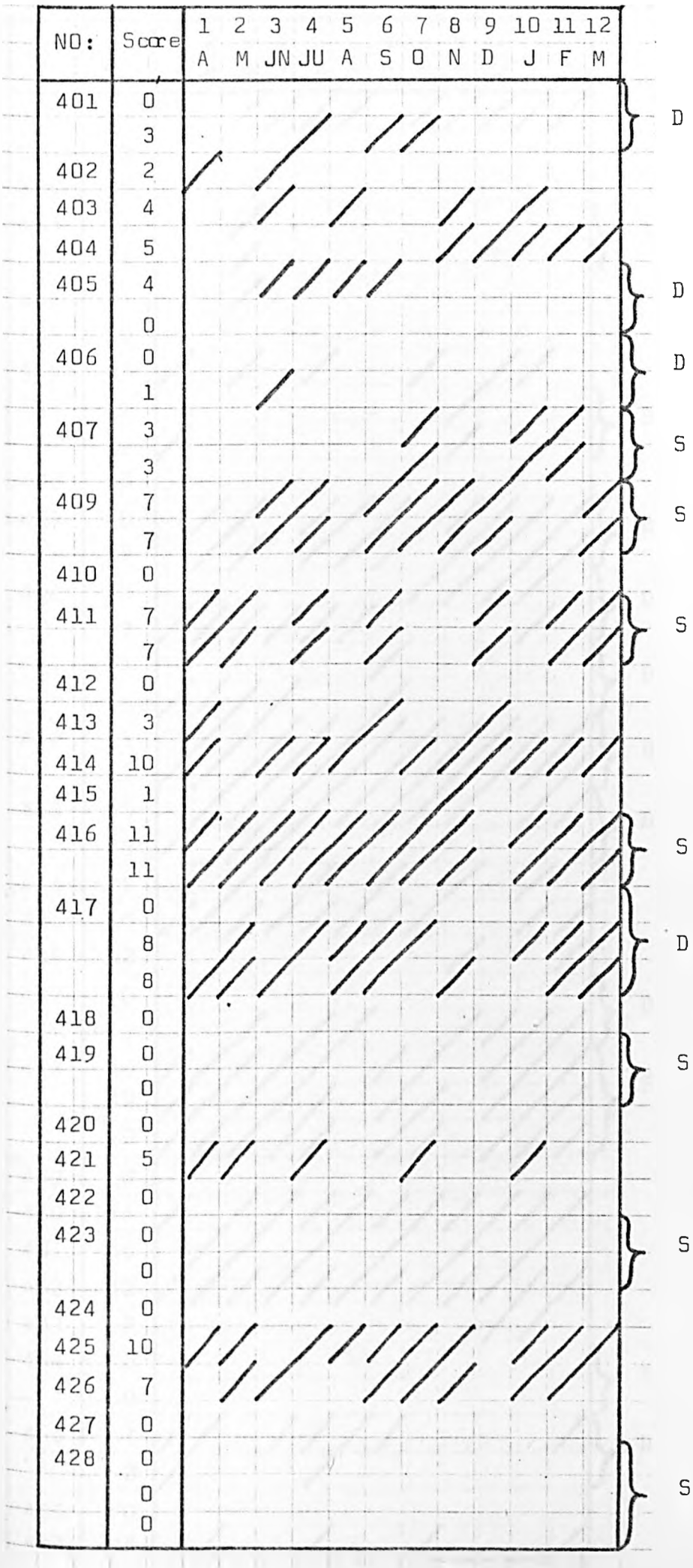
Distribution of Prescriptions which were NOT COLLECTED



APPENDIX 2

FEMALES

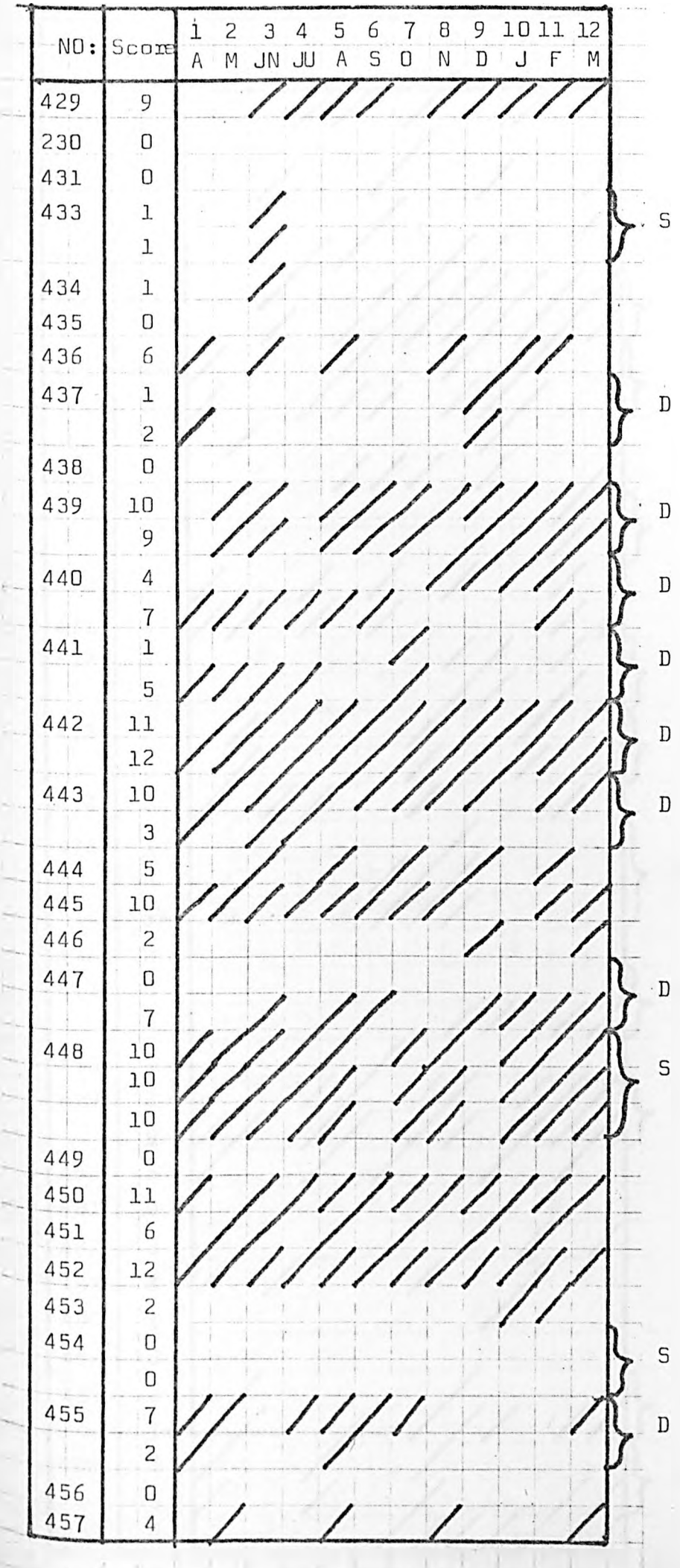
Distribution of Prescriptions which were NOT COLLECTED



APPENDIX 2

FEMALES

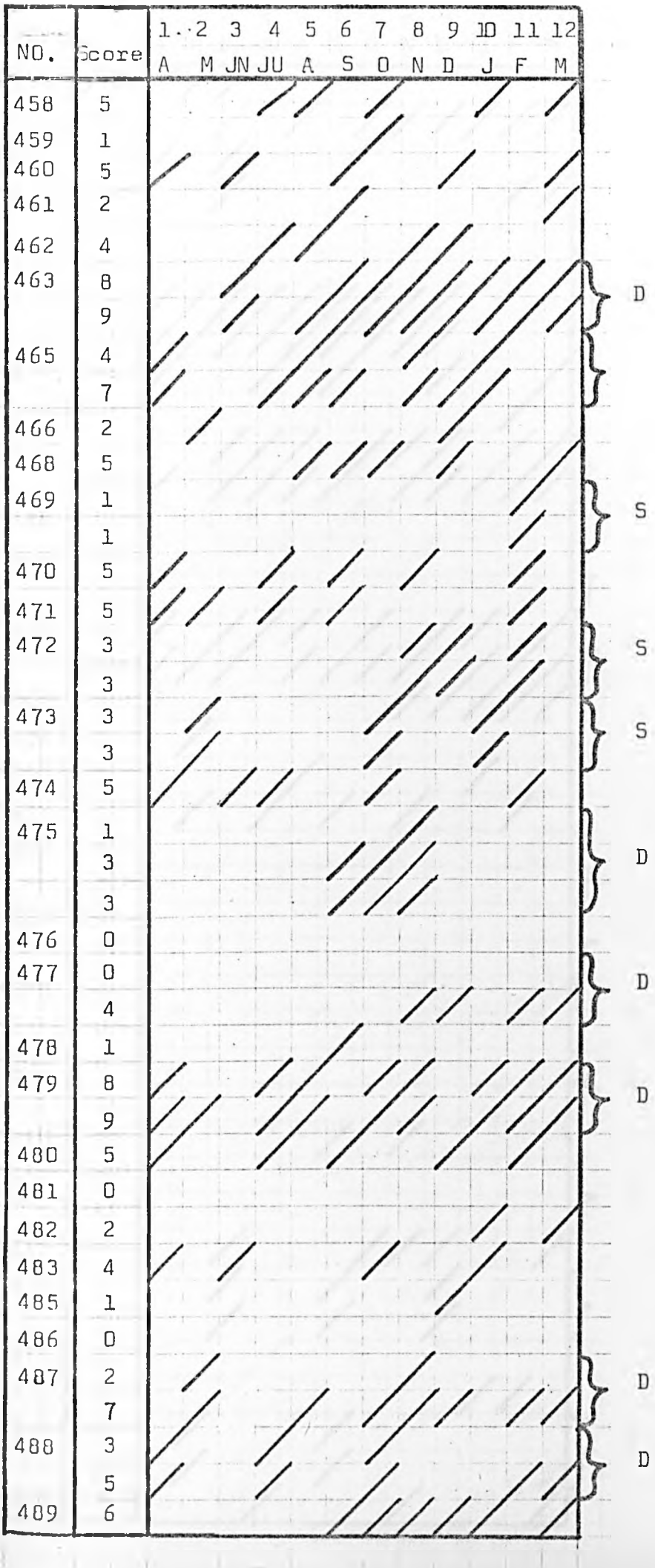
Distribution of Prescriptions which were NOT COLLECTED



APPENDIX 2

FEMALES

Distribution of Prescriptions which were NOT COLLECTED



APPENDIX 2

FEMALES

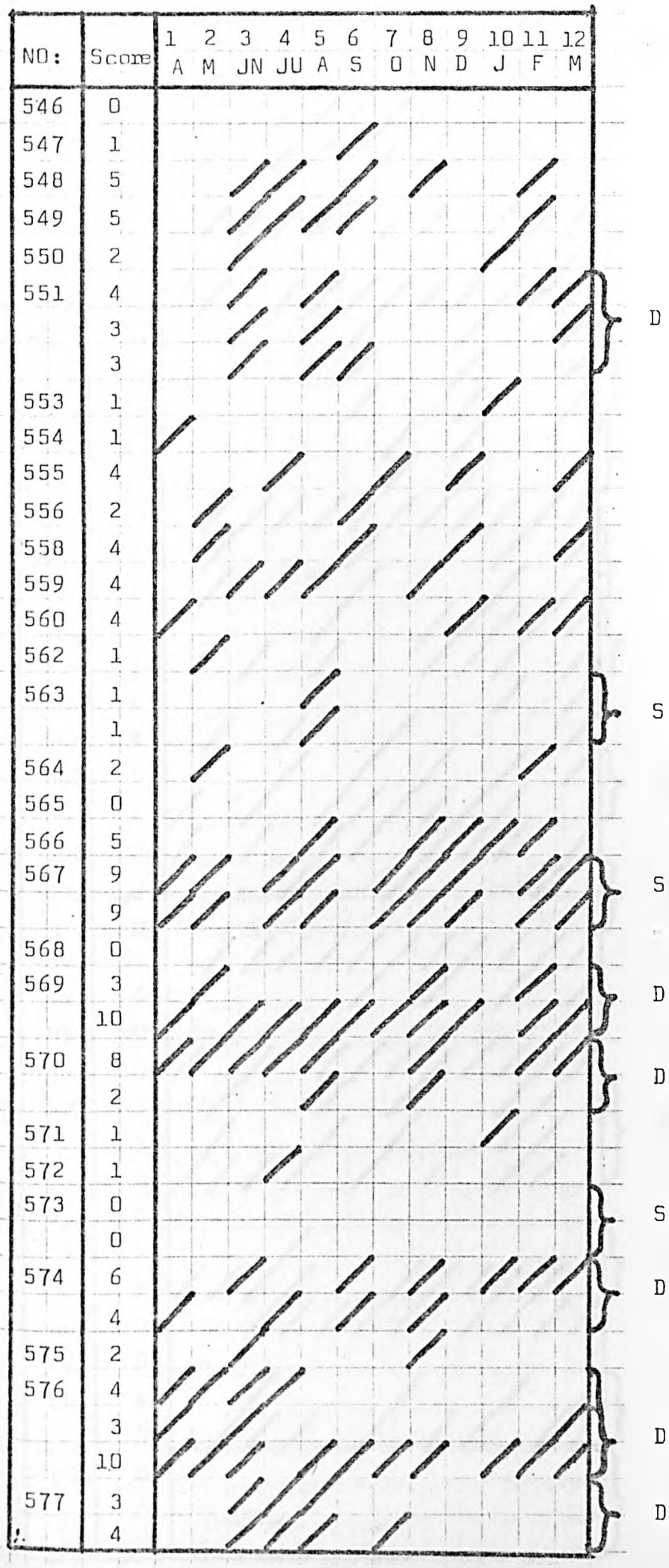
Distribution of Prescriptions which were NOT COLLECTED

NO:	Score	1 A	2 M	3 JN	4 JU	5 A	6 S	7 O	8 N	9 D	10 J	11 F	12 M	
490	3													
491	8													
492	2													
493	3													D
	0													
494	0													
	9													D
	9													
495	5													
496	1													
497	8													D
	10													
498	0													
499	0													S
	0													
500	8													D
	10													
501	5													
502	1													
503	2													
505	5													
506	0													S
	0													
507	0													S
	0													
508	0													S
	0													
509	0													S
	0													
510	2													
511	0													S
	0													
512	5													
513	3													S
	3													
514	0													
515	2													
516	2													S
	2													
517	3													

APPENDIX 2

FEMALES

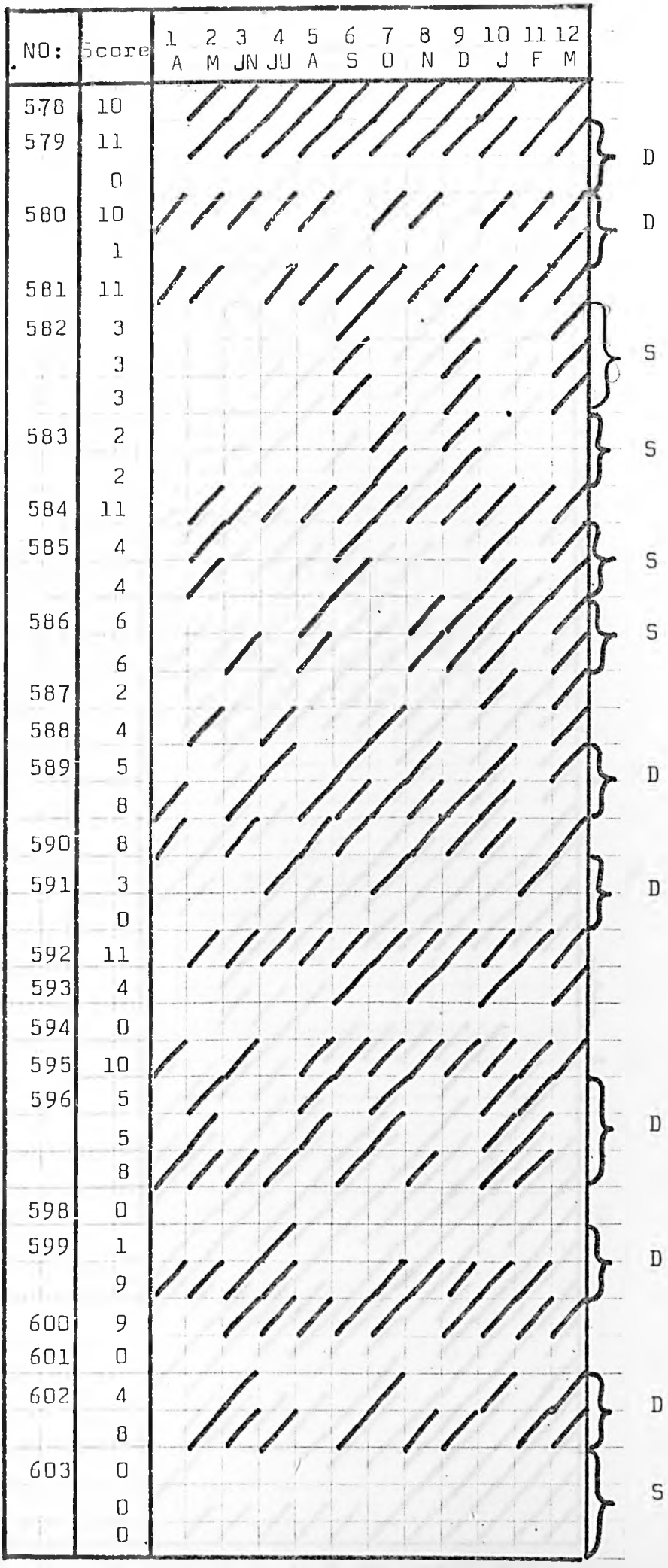
Distribution of Prescriptions which were NOT COLLECTED



APPENDIX 2

FEMALES

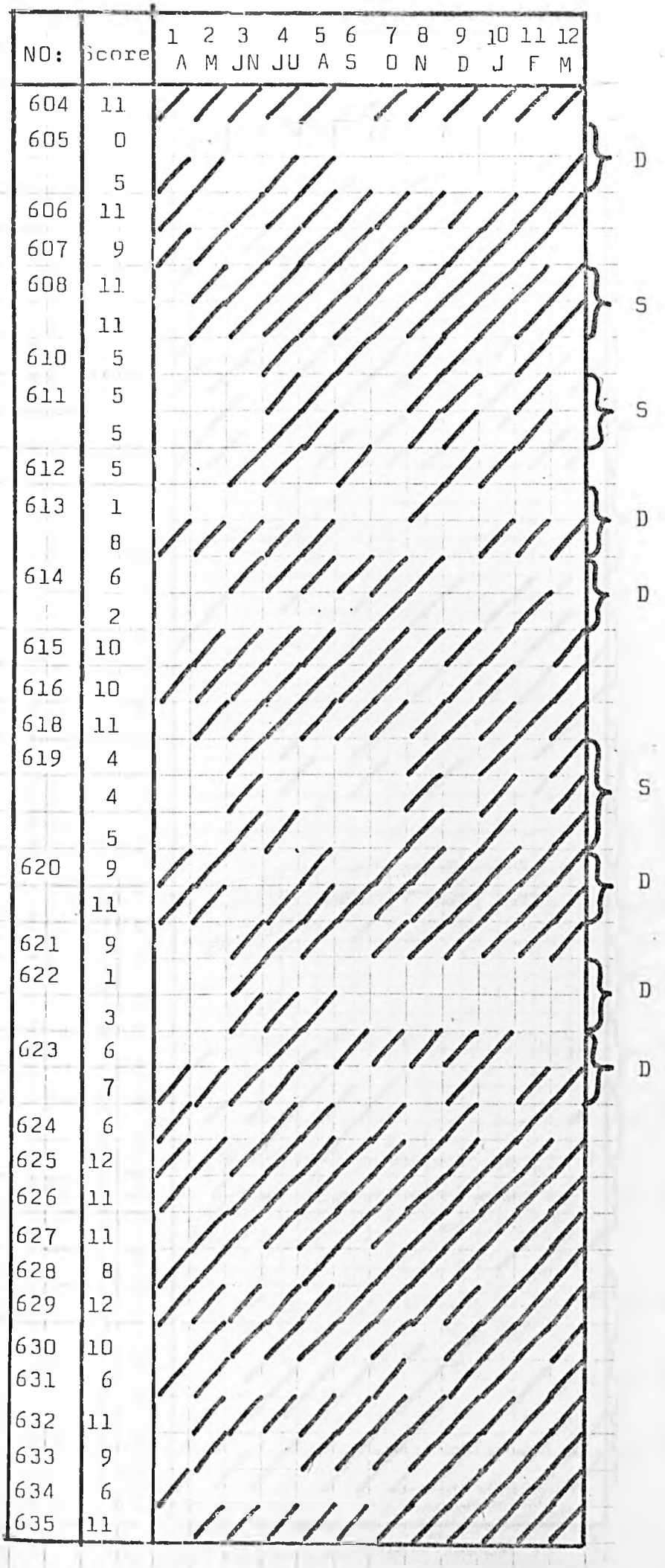
Distribution of Prescriptions which were NOT COLLECTED



APPENDIX 2

FEMALES

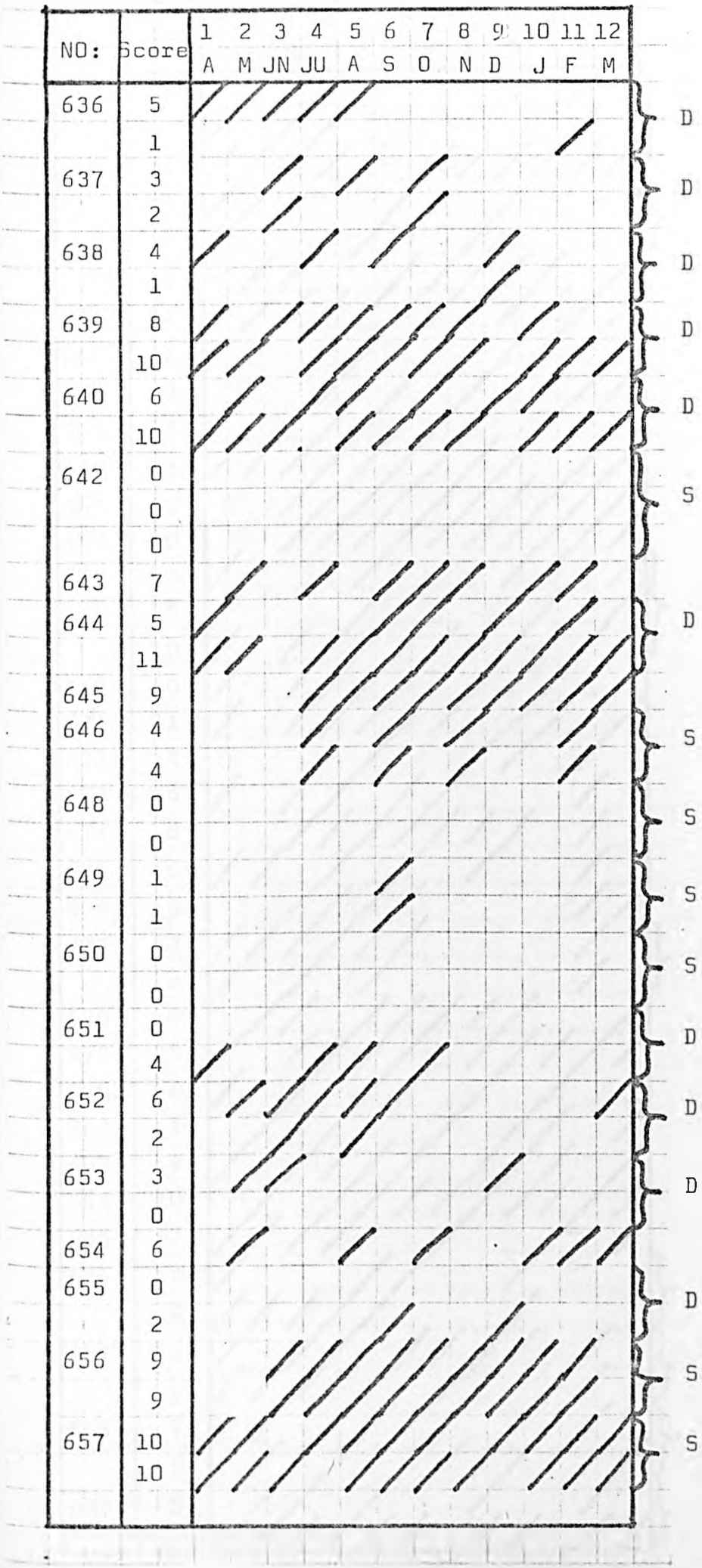
Distribution of Prescriptions which were NOT COLLECTED



APPENDIX 2

FEMALES

Distribution of Prescriptions which were NOT COLLECTED



APPENDIX 2

FEMALES

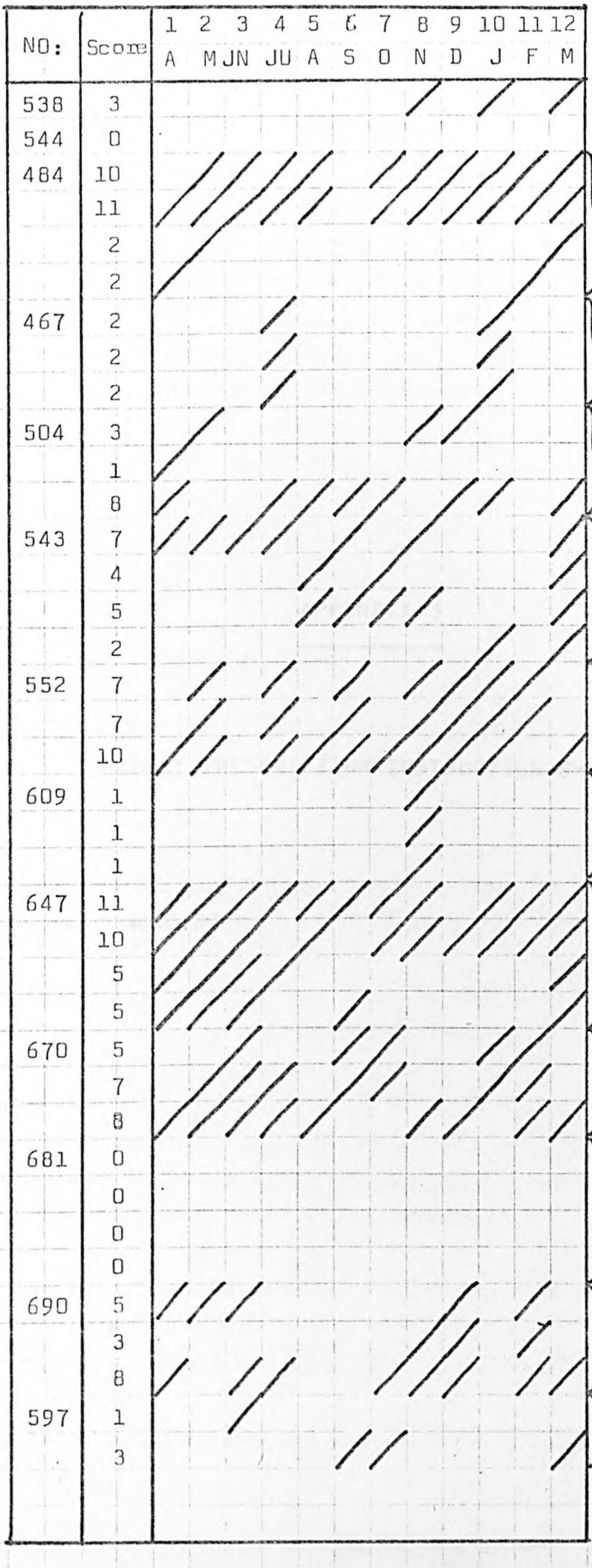
Distribution of Prescriptions which were NOT COLLECTED

NO:	Score	1 A	2 M	3 JN	4 JU	5 A	6 S	7 O	8 N	9 D	10 J	11 F	12 M	
658	4													
	4													D
	11													
659	4													
	3													D
660	8													
661	11													
662	6													
663	9													
664	8													
665	11													
666	10													
667	10													
668	5													
	5													D
	10													
669	10													
671	11													
672	4													
673	6													
674	8													
675	6													
676	6													
677	7													
	4													D
678	8													
679	10													
680	6													
682	7													
683	9													
684	10													
685	7													
686	4													
	6													D
687	8													
	9													D
688	7													
	9													D
689	5													
	10													D

APPENDIX 2

FEMALES

Distribution of Prescriptions which were NOT COLLECTED



APPENDIX 3

REPEAT PRESCRIPTION INSTRUCTION SHEET

REPEAT PRESCRIPTION INSTRUCTION SHEET

Arrangements for Issue of Repeat Prescriptions

As you have a medical condition requiring monthly prescriptions for a prolonged period, special arrangements have been made to help you obtain repeat prescriptions quickly and easily.

Please obtain your repeat prescription in one of the following ways:-

1. Collecting your prescription personally at the surgery, AFTER 10.0 a.m. on TUESDAYS, WEDNESDAYS, THURSDAYS, or SATURDAYS.

2. Asking a relative or friend to collect your prescription for you AT THE ABOVE TIMES

3. Sending a written request to the surgery: and enclosing a stamped, self-addressed envelope for your prescription.

N.B. As Mondays and Fridays are particularly busy days for the Receptionist, we regret that prescriptions CANNOT be issued at the surgery on these days.

Patients receiving repeat prescriptions need not see the doctor unless there is either a change in their existing medical condition, or new illness developes.

Necessary routine review of chronic conditions will be carried out at intervals, and you will receive an appointment to see the doctor for this purpose from time to time.

Doctors Lloyd and Isaacs,
The Gables,
Kershaw Street,
Shaw.

APPENDIX 4

AIDS TO ANALYSIS

TEMPLATE METHOD USED TO ASSIST ANALYSIS

MALES Page

NO	MS	SS	AGE	DOL	DIAG: 1						DIAG: 2						NO.OF DIAG:		NO.OF PRESCRIPT.				MEAN
					DC	AB	DOD	R_1	R_2	R_3	DC	AB	DOD	R_1	R_2	R_3	1_D	2_D	1_R	2_R	3_R	4_R	
				17				2	9	7													
				52				0	0					0									
				42				1						1									
				24				2															
				41				5															
				15				8															
				51				3	5														
				24				11						11									
				41				4															
				11				0						0									
				38				2	2														
				13				5						5									
				3				3															
				50				7															
				46				1															
				6				11															
				27				2															
				5				0															
				20				2															
				24				11						11									
				550				80	16	7				28									
				20				20	4	1				6									

APPENDIX

CC

APPENDIX 4 B

GROUP - Females.
DIVISION - Social group.
PAGE - one.

0	1	2	3	4	5	6	7	8	9	10	11	12	DIVISION	
✓✓✓✓ (4)					✓ (1)								Sg 1.	(5)
✓ (1)	✓ (1)		✓✓✓ ✓✓✓ ✓ (7)	✓✓✓ (3)		✓✓ ✓✓ (3)		✓✓ (2)	✓✓ (2)	✓✓ (2)		✓ (1)	Sg. 2	(22)
✓✓✓✓ ✓✓✓ ✓✓✓ (13)	✓✓ ✓✓ ✓✓✓ ✓ (7)	✓✓✓ ✓✓✓ ✓✓ (8)	✓✓✓ (3)	✓✓✓ ✓✓✓ ✓✓✓ ✓ (10)	✓✓✓ ✓✓✓✓ (7)	✓✓✓ ✓✓✓ ✓✓ (8)	✓✓ (2)	✓✓✓ ✓✓✓ ✓ (7)	✓✓✓ ✓ (4)	✓✓✓ ✓✓✓ (6)	✓✓✓ ✓✓✓ ✓✓✓ ✓ (10)	✓ (1)	Sg 3	(86)
✓✓✓ (3)	✓✓ ✓✓✓ (5)	✓✓✓ ✓✓✓ (6)	✓✓✓ (3)	✓✓✓ ✓✓✓ ✓ (7)	✓✓✓ ✓✓ (5)	✓✓✓ ✓✓✓ (6)	✓✓ (2)	✓✓✓ ✓ (4)	✓ ✓✓ (3)	✓✓ ✓✓ ✓✓ ✓ (7)	✓✓ ✓✓ ✓✓ (6)		Sg 4	(57)
✓✓ ✓✓ ✓✓ (6)	✓✓ ✓✓ ✓✓ ✓✓ (8)	✓✓ ✓✓ ✓ (5)	✓✓ ✓✓ ✓ ✓ (6)	✓✓ ✓✓ ✓✓ ✓ (7)	✓✓ ✓✓ ✓ (5)	✓ (1)	✓ ✓ (2)	✓✓ ✓✓ ✓ (5)	✓✓✓ ✓✓✓ (6)	✓✓ ✓ ✓ (5)	✓✓✓ ✓✓✓ (6)		Sg 5	(62)
(27)	(21)	(19)	(19)	(27)	(18)	(18)	(6)	(18)	(15)	(20)	(22)	(2)	232	

ILLUSTRATION ONLY

CALCULATION OF STANDARD DEVIATION

$$\bar{x} = \frac{\sum x}{n} =$$

x	$\bar{x}$	$x - \bar{x}$	$(x - \bar{x})^2$	f	$f(x - \bar{x})^2$	fx
				$\sum f$ =	$\sum f(x - \bar{x})^2$ =	$\sum fx$ =

$$s = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}}$$

$$= \sqrt{\quad}$$

$$= \sqrt{\quad}$$

$$= \sqrt{\quad}$$

$$=$$

DESCRIPTION

APPENDIX 5

LISTS OF ILLNESSES

TABLE 1

LIST OF ILLNESSES

The following conditions were only accepted when a Consultant had agreed the diagnosis.

ILLNESS	NO.	CRITERIA
ARTERIOSCLEROTIC H.D.	1	Consultant
ARTERIOSCLEROSIS - GENERAL	2	Consultant
ALLERGY	6	Consultant
AORTIC INCOMPETENCE	10	Consultant
ALCOHOLISM	13	Consultant
CRETINISM	17	Consultant only
CARCINOMA PROSTATE	18	Consultant only
CARCINOMA COLON	19	Consultant only
BRONCHIECTASIS	20	Consultant only - bronchogram
COELIAC DISEASE	22	Consultant only
DIABETES MELLITUS	24	Consultant only
C.V.A.	26	Consultant only
D.S.	27	Consultant only
MITRAL STENOSIS	39	Consultant
NEURALGIA - TRAUMATIC	40	Consultant
OSTEOPOROSIS	43	Consultant only - X-ray etc.
PARKINSONISM	45	Consultant
PERSONALITY DISORDER	47	Consultant
DETACHED RETINA	53	Consultant
SCHIZOPHRENIA	54	Consultant
THYROTOXICOSIS	55	Consultant
ULCERATIVE COLITIS	56	Consultant
HYPERCHOLESTEROLAEMIA	58	Consultant

TABLE 2

LIST OF ILLNESSES

ILLNESS	NO.	CRITERIA
ARTERIOSCLEROSIS - CEREBRAL	3	Evidence of stroke
ASTHMA	4	Personal observation
ASTHMATIC BRONCHITIS	5	Personal observation of attack
ANXIETY STATE	7	Clinical evaluation
ANGINA	8	History typical .ECG consistent.
ANOREXIA	9	Weight loss over 1 stone
ANAEMIA - IRON DEFICIENT	11	Haemoglobin of less than 70% on at least two occasions in previous two years, including one during previous three months.
ANAEMIA - P.A.	12	Achlorhydria and either deficient B.12 serum level or megaloblastic marrow
BLEPHARITIS	14	Clinical findings
CHRONIC BRONCHITIS	15	History and $\frac{FEVI}{FVC} < 70\%$
C.C.F.	16	Clinical findings
CONSTIPATION	21	History
DIABETES - MAT. ONSET	23	G.T.T. (abnormal)
CORONARY THROMBOSIS + M.I.	25	History and E.C.G.
DUODENAL ULCER	28	Ba. meal and history
DYSPEPSIA	29	History
EXCEMA	30	Clinical evaluation
EPILEPSY - GRAND MAL	31	Clear history of fit
GASTRIC ULCER	32	Ba. meal
HYPERTENSION	33	- 30 $\frac{150}{90}$ - 65 $\frac{170}{100}$ > 65 $\frac{200}{100}$

continued/

HYPOTHYROIDISM	34	Serum cholesterol above 250 and abnormal PBI or T4 Iodine
INSOMNIA	35	History
MUSCULAR RHEUMATISM	37	History
MIGRAINE	38	History of aura and headache, and vomiting
OSTEOARTHRITIS	41	X-ray confirmed evidence
OTITIS EXTERNA	42	Clinical observation
PEPTIC ULCER - UNSPECIFIED	44	History
PSORIASIS	46	Herald patch and appearance of eruption
PERIPHERAL NEURITIS	48	History and clinical findings
PERIPHERAL CIRCULATORY FAILURE	49	History and clinical findings
PELLAGRA	50	Clinical findings
RHEUMATOID ARTHRITIS	51	Clinical findings
RHEUMATISM - NON-SPECIFIC	52	History
DEPRESSION	57	History and clinical evaluation

APPENDIX 6

EFFECT OF CLINICAL INTERVENTION

TABLE 1

EFFECT OF CLINICAL INTERVENTION ON M.A.F.

CHRONIC BRONCHITIS

MALES

CLINIC GROUP							OTHERS					
No.	M.A.F.	No.of Surg. Att.	No. of Remind:	No. of Acute Bronch:	No.of Chest X-ray	No. of Hb.	No.	M.A.F.	No.of Surg. Att.	No. of Acute Bronch:	No.of Chest X-ray	No.of Hb.
282	2	10	1	0	1	1	283	7	2	1		
277	0	12	0	1	1	1	280	2	1	0		
	0	12	0	1	1	1	256	3	3	1		
254	11	5	7	2	2	1	243	7	5	2	1	1
241	8	12	0	1	1	1	240	3	0	0		
291	8	11	2	0	1	2	233	2	1	0		
230	8	12	0	1	1	1	222	7	4	1	1	
220	9	12	3	2	1	1	215	11	1	1		
214	4	14	0	0	1	1	213	10	1	1		
209	2	9	3	1	1	1	208	2	3	1		
	1	9	3	1	1	1	205	3	0	0		
206	2	4	6	2	0	1	202	5	2	1		
	5	4	6	2	0	1	190	0	4	0	1	1
203	6	11	0	0	1	0	289	6	2	1		
194	12	12	0	1	1	1	183	3	6	2	1	
188	9	2	8	1	1	1						

No	M.A.F.	No.of Surg Att.	No. of Remind:	No. of Acute Bronch:	No.of Chest X-ray	No.of Hb.	No.	M.A.F.	No.of Surg. Att:	No. of Acute Bronch:	No.of Chest X-ray	No.of Hb.
185	9	13	0	1	1	1	181	7	0	0		
182	0	16	0	1	1	1	170	6	3	0		
180	10	8	3	2	2	2		10	3	0		
163	6	11	0	0	1	1	160	2	6	1	1	
159	0	14	0	1	1	1	158	2	2	0		
153	5	12	0	1	1	1	149	11	2	1		
148	3	2	6	1	1	1	145	2	0	0		
	5	2	6	1	1	1	142	2	4	1		
144	1	12	0	0	1	1		9	4	1		
139	11	11	0	0	1	1		7	4	1		
137	7	12	0	2	0	1	138	7	2	0		
128	7	1	8	0	1	1	135	1	1	0		
123	0	13	0	1	1	1		0	1	0		
118	10	12	0	1	1	1		6	1	0		
113	0	11	0	1	1	1	127	3	2	1		
110	0	8	3	1	1	1	121	0	0	0		
108	4	6	5	0	1	1	116	8	4	0	1	1
104	8	12	0	1	1	1	109	0	2	0		
							107	11	1	0		
							101	4	6	1	1	
30	173	327	70	31	33	35	30	169	83	19	7	3

APPENDIX 6

TABLE 2

EFFECT OF CLINICAL INTERVENTION ON M.A.F.

CHRONIC BRONCHITIS

FEMALES

CLINIC GROUP							OTHERS					
No.	M.A.F.	No.of Surg. Att:	No. of Remind:	No. of Acute Bronch:	No.of Chest X-ray	No.of Hb.	No.	M.A.F.	No.of Surg. Att:	No. of Acute Bronch:	No.of Chest X-ray	No.of Hb.
462	4	12	0	1	1	1	421	5	1	0		
525	2	9	2	1	1	1	482	2	1	1		
530	1	14	0	0	1	1	528	5	2	1		
548	5	10	1	2	1	1	545	3	0	0		
554	1	12	0	1	1	2	583	1	1	0		
559	4	13	0	0	1	1	558	4	2	1		
564	2	8	4	1	0	1	560	4	4	2	1	1
571	1	12	0	1	1	1	565	0	2	1		
632	11	12	0	1	1	1	631	6	0	0		
635	11	4	7	0	0	0	634	6	3	1	1	
667	10	11	0	2	1	1	665	11	1	0		
676	6	12	0	3	2	1	673	6	1	1		
684	10	13	0	1	1	1	679	10	0	0		1

No.	M.A.F.	No. of Surg. Att:	No. of Remind:	No. of Acute Bronch:	No. of Chest X-ray	No.of Hb.	No.	M.A.F.	No. of Surg. Att:	No. of Acute Bronch:	No.of Chest X-ray	No.of Hb.
405	4	5	6	2	1	1	401	0	2	1		
524	2	14	0	1	1	1	443	10	3	2		
605	0	10	2	0	1	1	541	4	5	1	1	1
622	3	12	0	0	1	1	614	2	2	1		
647	10	12	0	1	1	1	688	7	0	0		
								10	0	0		
							609	1	0	0		
18	87	193	22	18	17	18	19	97	30	13	3	3

TABLE 3

EFFECT OF CLINICAL INTERVENTION ON M.A.F.
CHRONIC BRONCHITIS - MALES (CLINIC)

VITALOGRAPH AND HAEMOGLOBIN

No.	$\frac{FEVI}{FVC}$ %		Hb,
	Start	End	
282	57	63	112
277	55	54	110
254	39	43	96
241	42	65	106
291	68	63	102, 106
230	54	55	114
220	61	60	94
214	51	45	103
209	57	64	120
206	34	23	116
203	45	66	-
194	37	62	98
188	46	48	96
185	39	44	112
182	42	50	120
180	70	71	104, 96
163	65	60	110
159	55	60	107
153	38	47	120
148	40	62	96
144	64	67	98

continued/

No.	$\frac{FEVI}{FVC}$ %		Hb.
	Start	End	
139	50	72	101
137	66	71	106
128	50	50	116
123	60	54	99
118	50	75	100
113	32	39	116
110	45	45	98
108	54	57	84
104	49	48	103
TOTAL	1515	1683	
MEAN =	50.5		

Difference between Total Vitalograph at start and end = 1683 - 1515 = 168

TABLE 4

CHRONIC BRONCHITIS - MALES (OTHER THAN CLINIC)

VITALOGRAPH

EFFECT OF CLINICAL INTERVENTION ON M.A.F.

No.	$\frac{FEVI}{FVC}$ %	
	Start	End
283	58	58
280	69	64
256	44	52
243	52	50
240	56	56
233	56	74
222	42	46
215	38	42
213	67	65
208	55	54
205	63	65
202	46	44
190	70	72
289	61	60
183	44	44
181	65	63
170	58	60
160	68	65
158	49	52
149	53	58
145	44	56

continued/

No.	$\frac{FEVI}{FVC}$ %	
	Start	End
142	67	66
138	69	68
135	46	49
127	36	38
121	54	62
116	47	44
109	61	70
107	39	43
101	52	44
TOTAL	1629	1684
MEAN = 54.3		

Difference between total Vitalograph at start and end = 1684 - 1629 = 55

TABLE 5

APPENDIX 6

EFFECT OF CLINICAL INTERVENTION ON M.A.F.

CHRONIC BRONCHITIS - FEMALES (CLINIC)

VITALOGRAPH AND HAEMOGLOBIN

No.	$\frac{FEVI}{FVC}$ %		Hb.
	Start	End	
462	62	71	106
525	68	77	96
530	55	64	102
548	42	43	116
554	44	70	122, 118
559	49	56	102
564	56	54	96
571	49	61	100
632	69	69	88
635	58	65	-
667	46	53	108
676	36	40	120
684	68	72	97
405	65	64	98
524	54	58	107
605	62	68	101
622	43	39	112
647	37	39	100

TABLE 6

EFFECT OF CLINICAL INTERVENTION ON M.A.F.

ANAEMIA

MALES AND FEMALES

CLINIC GROUP					OTHERS			
No.	M.A.F.	No.of Surg. Att:	No. of Remind:	No. of Hb.	No.	M.A.F.	No. of Surg. Att:	No.of Hb.
535	1	4	1	3	671	11	1	
	10	4	0	2	497	8	0	
673	6	3	1	2		10	2	1
	7	3	1	3	656	9	0	
669	10	4	0	2	670	7	0	
678	8	2	3	1	500	8	1	
229	10	4	0	4		10	1	
219	12	4	0	2	654	6	3	1
483	4	5	0	3	416	11	0	
543	7	3	2	2	674	8	0	
	4	4	0	2	439	9	1	
411	7	2	2	3	579	11	0	
690	8	4	1	1		0	0	
580	10	4	0	1	683	9	0	
	1	4	0	1	467	2	1	
619	4	4	0	2		2	1	

No.	M.A.F.	No.of Surg. Att:	No. of Remind:	No. of Hb.	No.	M.A.F.	No. of Surg. Att:	No. of Hb.
425	10	4	0	2	589	8	0	
531	0	3	2	4	642	0	0	
576	10	4	0	2	613	1	1	1
566	5	4	0	3		8	0	
626	11	4	0	2	639	8	0	
504	3	4	1	3		10	0	
494	9	4	1	2	539	2	1	
401	3	1	0	1	602	4	2	1
						8	2	
					129	2	0	
20	160	89	16	55	19	172	17	4

TABLE 7

EFFECT OF CLINICAL INTERVENTION ON M.A.F.

ANAEMIA GROUP (CLINIC)

HAEMOGLOBIN VALUES

No.	Type of Anaemia	Haemoglobin %		Notes
		Start	Other	
535	PA	68	74, 74)	Evaluation at differing times
535	Iron	68	76)	
673	PA	57	77	
673	Iron	57	77, 82	
669	Iron	66	88	
678	Iron	70		
229	Iron	47	54, 58, 67	
219	Iron	68	89	
483	Iron	68	88, 96	
543	Iron	70		
543	PA	70		
411	Iron	66	68, 77	
690	Iron	70		
580	Iron	68		
580	PA	68		
619	Iron and FA	56	72	
425	PA	67	88	
531	PA	54	56, 56) 74)	Evaluation at differing times
531	Iron	54	62)	
576	Iron	68	74	
566	Iron	55	82, 94	
626	Iron	70	96	
504	PA	66	68, 66	
494	Iron	27	54	
401	Iron	68		

APPENDIX 7

EXTREMES OF M.A.F. RANGE

TABLE 1 (a)

HIGH M.A.F. SCORE - 11 - (MALES)

MS	SS	AGE	DOL	DC	AB	DOD	NO:R	NO: OF DIAG:
W	3	79	8	15	A	6	1	1
W	5	69	52	15	A	16	1	1
M	5	36	5	28	A	5	1	1
S	3	13	13	4	B	6	1	1
M)	5	46	24	15	A	5	2)	2
M)	5	46	24	31	B	33	2)	2
S	3	14	6	4	B	12	1	1
M)	3	76	24	33	B	4	2)	2
M)	3	76	24	51	B	23	2)	2
S	2	9	9	4	B	6	1	1
M	3	80	32	1	A	18	1	1
M	3	66	17	1	A	10	2	1
M	4	65	15	23	A	7	2	1
M	2	39	22	28	A	15	1	1
M	3	72	32	15	A	2	1	1
M)	4	57	23	28	A	11	2)	1
M)	4	57	23	28	A	11	2)	1
M	5	65	46	23	A	3	1	1
M	4	50	17	15	A	4	1	1

TABLE 1 (b)

HIGH M.A.F. SCORE - 12 - (MALES)

MS	SS	AGE	DOL	DC	AB	DOD	NO:R	NO: OF DIAG:
M	4	70	46	8	B	12	2	1
M	5	63	24	51	A	22	1	1
M	3	47	21	25	A	8	3	1
M	3	44	4	28	A	16	1	1
M	4	60	24	15	A	5	1	1
M	4	65	15	23	A	7	2	1
M	4	50	34	30	A	6	1	1
W	5	72	51	11	B	4	3	3

TOTAL PATIENTS (MALE) WITH 11 and 12 M.A.F. SCORE = 27

TOTAL AGE = 1436

MEAN AGE = 53

TOTAL DOL = 635

MEAN DOL = 23.5

TOTAL DOD = 277

MEAN DOD = 10

TABLE 2 (a)

HIGH M.A.F. SCORE - 11 - (FEMALE)

MS	SS	AGE	DOL	DC	AB	DOD	NO:R	NO.OF DIAG:
M)	3	49	7	51	A	19	2)	2
M)	3	49	7	11	B	11	2)	2
W	3	77	22	35	B	3	1	1
M	5	51	16	11	B	2	2	2
M	3	43	19	38	B	6	1	1
M	3	66	9	28	A	2	1	1
M	3	37	11	57	A	6	1	1
M	3	40	8	49	A	3	1	1
M	4	69	22	33	A	6	1	1
W)	5	78	44	61	A	6	2)	1
W)	5	78	44	41	A	6	2)	1
W	4	78	23	37	B	2	1	1
M	5	62	36	8	A	7	2	2
M	3	46	3	11	B	1	1	1
M	4	40	24	51	B	2	1	1
M	3	79	49	15	B	2	1	1
M	4	64	6	15	B	2	1	1
M	3	54	17	39	A	8	2	1
M	5	62	22	23	A	6	3	2
M	5	49	33	51	B	4	1	1
M	3	76	29	15	B	3	1	1
W	3	78	18	11	B	1	1	1
S	4	69	52	33	A	4	4	2
W	3	78	23	33	A	12	4	2
M	4	72	56	2	A	5	2	1

TABLE 2 (b)

HIGH M.A.F. SCORE - 12 - (FEMALE)

MS	SS	AGE	DOL	DC	AB	DOD	NO:R	NO: OF DIAG:
M	4	72	56	2	A	5	2	1
M	4	65	32	33	A	8	1	1
S	2	8	8	4	A	4	1	1
M	3	30	6	49	B	2	1	1

TOTAL PATIENTS (FEMALE) WITH 11 and 12 M.A.F. SCORE = 29

TOTAL AGE = 1632
MEAN AGE = 56

TOTAL DOL = 702
MEAN DOL = 24

TOTAL DOD = 148
MEAN DOD = 5

TABLE 3 (a)

M.A.F. SCORE OF 0 (MALES)

MS	SS	AGE	DOL	DC	AB	DOD	NO:R	NO: OF DIAG:
M	5	45	8	35	B	6	1	1
M	3	64	9	15	B	10	1	1
M	5	69	26	15	B	8	1	1
M	5	69	52	15	A	16	1	1
M	5	70	24	2	A	12	1	1
M)	3	64	21	34	B	8	2)	2
M)	3	64	21	15	B	4	2)	2
M)	3	65	48	24	A	4	2)	2
M)	3	65	48	15	A	4	2)	2
S	3	2	2	4	A	1	1	1
S	2	5	5	31	A	3	1	1
M	5	67	51	15	A	8	3	1
M)	3	69	52	.1	A	11	3)	2
M)	3	69	52	1	A	11	3)	2
M)	3	69	52	35	B	13	3)	2
M)	3	61	11	8	A	10	2)	2
M)	3	61	11	35	B	16	2)	2
M	3	63	5	15	B	5	1	1
M	2	61	46	35	A	4	1	1
W	5	62	16	15	A	3	1	1
M	3	78	51	15	B	18	1	1
M)	4	79	51	1	A	5	3)	2
M)	4	79	51	51	B	17	3)	2
M)	4	79	51	51	B	17	3)	2
S	5	12	6	31	A	10	2	1
M	2	78	23	8	B	11	1	1
M	1	36	3	24	A	7	3	2

continued/

MS	SS	AGE	DOL	DC	AB	DOD	NO:R	NO: OF DIAG:
M)	4	73	8	8	A	26	2)	1
M)	4	73	8	8	A	26	2)	1
S	2	17	5	4	A	12	2	1
M	3	45	45	34	A	6	1	1
S	5	55	38	23	A	4	2	1
M)	4	62	33	27	A	27	2)	1
M)	4	62	33	27	A	27	2)	1
M	1	61	5	35	B	20	1	1
M	5	74	51	35	B	13	1	1
M)	3	77	22	5	A	32	2)	1
M)	3	77	22	5	A	32	2)	1
M	4	52	25	28	B	18	1	1
M)	5	78	18	25	A	16	4)	1
M)	5	78	18	25	A	16	4)	1
M)	5	78	18	25	A	16	4)	1
M)	5	78	18	25	A	16	4)	1

TOTAL PATIENTS (MALE) WITH 0 M.A.F. SCORE = 43

TOTAL AGE = 2498

MEAN AGE = 58

TOTAL DOL = 1112

MEAN DOL = 26

TOTAL DOD = 549

MEAN DOD = 13

TABLE 3 (b)

M.A.F. SCORE OF 0 (FEMALES)

MS	SS	AGE	DOL	DC	AB	DOD	NO:R	NO: OF DIAG:
W	3	68	19	15	B	3	2	2
M	5	61	7	41	B	4	2	2
M	3	63	33	30	A	5	2	2
S	3	57	27	35	B	14	1	1
W	4	66	33	35	B	11	1	1
M	3	76	19	4	A	12	3	1
M	3	64	22	34	A	7	1	1
S)	4	80	56	33	A	21	2)	1
S)	4	80	56	33	A	21	2)	1
M	4	72	14	35	A	12	1	1
M	3	79	6	35	B	21	1	1
S)	4	70	13	51	B	24	2)	1
S)	4	70	13	51	B	24	2)	1
M	3	68	51	21	B	20	1	1
M	3	51	23	57	A	12	1	1
M)	5	69	24	25	A	2	3)	2
M)	5	69	24	25	A	2	3)	2
M)	5	69	24	15	B	3	3)	2
M	3	61	6	35	B	11	1	1
S	5	81	19	2	B	19	1	1
M	4	62	23	16	A	6	1	1
M	3	66	30	35	B	2	1	1
W	4	73	23	51	A	25	2	2
W	3	76	19	35	B	13	1	1
M	4	84	18	2	A	17	2	2
M	4	84	18	35	B	30	2	2

continued/

MS	SS	AGE	DOL	DC	AB	DOD	NO:R	NO: OF DIAG:
M	4	74	8	2	A	6	1	1
M	3	45	19	28	A	2	1	1
W)	2	73	23	35	B	13	2)	2
W)	2	73	23	34	A	8	2)	2
S	5	72	47	33	A	6	1	1
M	3	56	23	33	B	11	1	1
M	1	39	12	38	B	2	2	2
W	5	69	53	51	A	10	3	2
S	4	5	5	4	B	3	1	1
W)	3	87	7	1	A	6	2)	1
W)	3	87	7	1	A	6	2)	1
W)	5	80	23	16	B	4	2)	2
W)	5	80	23	35	B	16	2)	2
W)	3	76	22	16	A	6	2)	2
W)	3	76	22	35	B	2	2)	2
W M)	5	76	22	1	A	9	2)	2
M)	5	76	22	35	B	16	2)	2
W)	3	62	19	33	A	8	2)	2
W)	3	62	19	35	B	12	2)	2
S)	5	70	8	34	A	6	2)	2
S)	5	70	8	35	B	23	2)	2
M	5	64	48	25	A	6	1	1
W)	4	75	42	12	A	1	2)	2
W)	4	75	42	11	A	1	2)	2
M	3	74	23	35	A	18	2	2
M	3	55	13	34	A	8	1	1
M	4	72	14	51	A	8	1	1
M	3	71	12	15	B	2	1	1
M	3	67	23	34	A	8	1	1
W)	4	78	40	23	A	3	2)	1
W)	4	78	40	23	A	3	2)	1
M	5	51	16	12	B	2	2	2

continued/

MS	SS	AGE	DOL	DC	AB	DOD	NO:R	NO: OF DIAG:
W	4	75	5	16	A	4	2	2
S	5	73	56	33	B	16	1	1
M	5	51	19	33	B	2	1	1
M	3	63	34	33	B	5	1	1
S)	1	76	12	2	A	4	3)	2
S)	1	76	12	2	A	4	3)	2
S)	1	76	12	8	A	4	3)	2
M	1	61	33	15	B	2	2	2
S)	3	72	55	23	A	4	3)	2
S)	3	72	55	23	A	4	3)	2
S)	3	72	55	23	A	4	3)	2
M)	3	68	22	33	A	13	2)	2
M)	3	68	22	35	A	17	2)	2
W	5	77	42	33	A	16	2	2
W	5	77	33	35	B	21	2	2
W	2	76	4	33	A	10	2	2
S	3	27	12	31	A	15	2	1
M)	3	70	23	33	A	8	4)	3
M)	3	70	23	53	A	4	4)	3
M)	3	70	23	53	A	4	4)	3
M)	3	70	23	21	B	10	4)	3
M	3	65	18	34	A	6	1	1

TOTAL PATIENTS (FEMALE) WITH 0 M.A.F. SCORE = 80

TOTAL AGE = 5346

MEAN AGE = 67

TOTAL DOL = 1944

MEAN DOL = 23

TOTAL DOD = 742

MEAN DOD = 9

APPENDIX 8

CHRONIC BRONCHITIS ASSESSMENT SHEET

APPENDIX 8

CHRONIC BRONCHITIS ASSESSMENT SHEET

NAME Sex Social Class

ADDRESS

Date of Birth

Significant previous Illnesses:

Byssinosis

Silocosis

Asthma

Tuberculosis

Cough Mornings - duration in years ☐
(M.R.C. Group I or worse)

Sputum Duration in years ☐

Amount

Colour

Haemoptysis

Breathlessness Duration in years ☐

Severity (yards on the flat)

Acute Attacks Last 2 years

Family History:-

Grandparents

Parents

Brothers and Sisters

Colour of skin Cyanosis ☐ Clubbing ☐

Build

B.P. Pulse Heart

Oedema

Liver Enlargement

X-Ray Chest FEVI Hb

FVC