A SURVEY OF PRESCRIBING IN SCOTLAND IN 1951

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A survey of 17,301 prescriptions issued on Form E.C.10 in England in 1949 (Dunlop *et al.*, 1952) provided an incentive to a further and more extended investigation of prescribing, and in addition indicated how a subsequent study could be planned in order to give more varied and statistically valid information, and to avoid some of the errors to which our attention was drawn in the previous paper. Scotland was chosen as the area to be surveyed, as it formed a manageable unit and represented all types of medical practice.

Material and Method

The material consisted of an approximately 1% sample of all E.C.10 forms issued in each of the 25 executive council areas in Scotland during the month of October, 1951. There were 13,340 of such forms, which included a total of 18,848 prescriptions. Except for a few minor changes the method of tabulation and sorting was similar to that adopted in our previous survey of English prescriptions. Nevertheless, since the method of selection was different and since the present survey follows the previous one after an interval of two

years, no very close comparison can be made between the results of the two surveys. It will be seen, however, that on the whole the frequency with which different drugs are ordered and the form in which they are prescribed are not dissimilar in England and Scotland.

In addition to the E.C.10 forms all the E.C.10A forms (stock order forms) for the same month of October were scrutinized. Their total number was 1,569. In Scotland such forms are used by practitioners to order drugs and appliances which they personally administer.

Results

That the orders on E.C.10A forms comprised only an insignificant part of the cost of the total prescriptions is indicated by the following figures:

Total cost of orders on Form E.C.10A in Scotland in October, 1951	£ 8,500
Total cost of prescriptions on Form E.C.10 in Scotland in October, 1951	412,500

Thus the cost of orders on Form E.C.10A comprised only about 2% of the total prescribing costs, and involved an average yearly expenditure per practitioner of £42 10s. About 45% of the orders on these forms were for dressings and appliances.

A study of the E.C.10A forms revealed only a small number of lavish and extravagant orders, though a total of 200 ml. of a proprietary liver extract on one form seemed hard to justify. Over 7 tons (7,112 kg.) of cotton-wool are ordered yearly on E.C.10A forms alone. Though the figure seems formidable, it represents a yearly consumption of rather less than 6½ lb. (2.9 kg.) per doctor.

The figures in Tables I and II have been grouped under the five Scottish regions. In addition those pertaining to the four main cities have been extracted separately. Even with this grouping a considerable variation in the average number of patients per practitioner (list size) and in the number of E.C.10 forms issued per unit (1,000 persons) of population is apparent, and the proportion of E.C.10 forms

TABLE I

	Western Region (Excluding Glasgow)	Glasgow City	S-eastern Region (Excluding Edinburgh)	Edinburgh City	Eastern Region (Excluding Dundee)	Dundee City	N-eastern Region (Excluding Aberdeen)	Aberdeen City	Northern Region
Population	1,740,200	1,093,276	643,192	465,913	223,879	177,890	316,754	181,923	173,912
No. of prescriptions analysed	6,364	4,959	2,237	1,732	633	667	1,066	780	420
E.C.10 forms per 1,000 population	248	311	252	257	212	264	246	312	182
Average list size	2,270	2,078	2,290	1,801	1,930	2,069	1,720	2,220	1,510

TABLE II.—Principal Types of Prescription and Groups of Drugs Prescribed

	Percentage of Total Prescriptions								
	Western Region (Excluding Glasgow)	Glasgow City	S-eastern Region (Excluding Edinburgh)	Edinburgh City	Eastern Region (Excluding Dundee)	Dundee City	N-eastern Region (Excluding Aberdeen)	Aberdeen City	Northern Region
Proprietary	32.8	31.6	28.8	28.3	31.4	27.4	35.5	27.4	36.5
Tablets	32.6	30.6	36.0	34.5	36.5	30.3	34.6	35.0	39.3
Mixtures	28.8	32.6	26.0	26.7	29.7	32.6	28.7	28.7	28.4
Skin preparations	14.6	14.4	13.6	14.8	11.5	13.8	11.3	13.3	9.6
Dressings	10.1	9.8	12.0	10.3	8.2	11.5	9.8	9.9	9.1
Powders	4.4	3.7	3.4	3.7	2.8	4.9	4.4	3.7	3.1
Eye, ear, nose	3.5	3.2	3.6	4.6	3.3	3.0	4.1	4.9	3.3
Injections	2.8	2.1	2.8	2.0	3.6	1.8	3.1	1.8	4.8
Gargles	1.7	2.3	1.5	1.9	3.0	1.0	2.1	1.8	0
Barbiturate	9.9	9.6	9.3	11.0	10.7	8.5	10.6	10.5	13.1
Bromide	1.1	1.2	0.9	0.5	1.7	1.5	1.1	1.0	1.0
Mild analgesic	9.0	10.6	10.3	9.3	9.2	10.9	10.1	9.0	8.2
Cough preparation	8.5	10.0	8.4	8.7	8.2	10.1	7.7	12.4	4.8
Stomachic	7.9	7.3	5.7	6.5	5.7	9.0	8.4	5.1	11.3
Antispasmodic	7.0	6.8	5.9	6.7	7.0	4.8	7.3	7.8	5.3
Sulphonamide	5.7	6.6	5.6	6.8	6.3	7.0	4.7	5.6	5.8
Antibiotic	5.4	5.2	4.4	4.7	4.1	4.3	4.9	5.1	5.5
Vitamin	5.0	5.6	5.1	4.9	6.6	4.5	5.8	3.4	6.2
Tonic	4.5	4.5	3.0	3.7	3.8	4.9	3.6	3.6	3.9
Antihistamine	4.3	2.9	3.0	3.6	3.2	3.4	3.3	4.1	5.5
Iron	3.3	3.0	3.0	3.3	3.2	3.1	2.4	3.1	2.9
Laxative	2.1	2.1	2.8	2.0	4.0	2.7	2.4	3.0	2.1
Strong analgesic	1.8	2.8	2.0	2.6	2.2	1.8	1.8	2.1	2.2
Amphetamine	2.0	1.8	2.1	1.7	1.3	1.5	1.9	1.8	0.5

issued per unit of population seems to vary according to the population density of the area. The significance of this finding is discussed later.

Vitamins, tonics, and symptomatic remedies (sedatives, hypnotics, analgesics, cough mixtures, stomachics, and laxatives) constituted 51.6% of all prescriptions written. A large proportion of these drugs must be prescribed as placebos. They are often relatively cheap in themselves, yet the total cost of compounding and packing them is relatively enormous. Thus, if the cost of prescriptions to the State is to be diminished it must be directed to a reduction of these symptomatic remedies as well as to extravagant prescriptions of expensive drugs to which so much attention has been directed in the past.

The general pattern of prescribing was similar to that found in the earlier English survey, but the following points seem worthy of emphasis because of their dissimilarity or of reiteration because of their importance.

As was to be expected after a lapse of two years, there was some increase in the prescription of newer drugs such as the antibiotics and the antihistamines. In Scotland, however, the prescription of the amphetamines was not significantly more frequent than it had been in England two years previously—a somewhat surprising finding in view of the Pricing Bureau's figures for 1952.

The variation in the proportion of proprietary preparations prescribed in the different areas was not great, but the overall proportion (30%) is considerably higher than the corresponding figure (21%) in the previous survey. An accurate comparable English figure for 1951 was not available to us, but this suggests that the tendency to prescribe proprietary medicines is either increasing generally or is greater in Scotland than in England.

It is satisfactory to note that bromides were prescribed alone very rarely (1%) compared with the previous English figure of 5.8%. Bromides seldom prove more effective than phenobarbitone either as sedatives or as anticonvulsants. Their frequent side-effects and the undesirable cumulative toxic effects which result from their prolonged administration relegate bromides to the group of drugs which should largely be discarded in modern therapeutics. Bromides, however, were prescribed with chloral hydrate on 40 occasions, representing some 4,000 of such prescriptions in Scotland in

October, 1951. It seems unfortunate that this mixture should appear in the *National Formulary* for 1952, for bromides are sedatives which have to be administered frequently before there is a sufficient replacement of chloride by bromide ion to exert a depressant effect on the central nervous system, and their occasional administration with a hypnotic such as chloral has no more effect than a dose of salt water.

Compound cough mixtures containing sedatives and expectorants were ordered as often as sedative preparations, but purely expectorant cough mixtures were not ordered as often as either. This is satisfactory, as there is considerable doubt about the value of expectorants, which were found to be very commonly prescribed in the English survey.

The proportion of prescriptions for cough mixtures was higher in the urban than in the rural areas. This was particularly noticeable in the case of Aberdeen City (12.4%) in comparison with the remainder of the North-eastern Region (7.7%). Such figures seem to indicate that coughs are one of the hazards of city as opposed to country life, and support is given to this hypothesis by the mortality figures for respiratory disease in the Registrar-General's report. On the other hand, there was no constant similar trend in the proportion of prescriptions for stomachics in town and country, which does not support the general impression that dyspepsia is also one of the penalties of urban life.

As in the previous survey, vitamins were prescribed more often than iron, and constituted about 5% of all prescriptions. The actual number of prescriptions for vitamins in the 1% sample of prescriptions analysed was 976—that is, approximately 97,600 for the month of October in Scotland, or over one million for the year. When it is remembered that the average prescription on Form E.C.10 costs the country over 4s., and that vitamins are often relatively expensive drugs, a very conservative estimate of the cost of vitamin prescriptions in Scotland for the year is £230,000. As the population of Scotland is about one-ninth that of the United Kingdom it might be argued that the bill for vitamin prescriptions alone in Britain is at least £2,000,000. This estimate is intentionally a very conservative one, since, as will be seen later, the number of prescriptions issued in October happened to be above average. That the figure

TABLE III

	No. of Registered Patients	No. of Doctors	Scripts Issued 1951					
			July	August	September	October	November	December
Western hospital region:								
City of Glasgow	1,093,276	526	224,923	258,486	279,743	339,656	327,146	286,412
Argyll and Bute (counties of)	75,709	61	14,969	14,284	13,644	14,916	14,421	13,056
Ayr (and county of)	313,134	139	66,635	66,880	70,546	79,478	77,907	71,468
Dumfries (and county of)	82,552	38	18,004	18,287	18,874	22,578	21,698	19,985
Dunbarton (county of)	156,303	62	31,124	34,562	36,033	44,192	42,928	37,869
Galloway (Kirkcudbright and Wigtown (and counties of)	59,335	34	10,084	10,420	10,635	11,545	11,407	10,795
Lanark (and county of)	512,530	205	104,940	109,366	118,335	139,910	137,154	122,710
Renfrew (and county of)	322,626	136	60,934	60,491	65,823	80,068	77,591	65,059
Stirling and Clackmannan (and counties of)	218,011	92	44,865	45,162	49,177	58,520	57,607	52,347
South-eastern hospital region:								
City of Edinburgh	465,913	259	89,586	87,649	93,323	119,840	116,602	101,233
Fife (county of)	301,776	123	69,052	69,817	73,368	83,960	82,399	76,650
Lothians and Peebles (and counties of)	249,457	106	45,641	47,669	49,427	57,212	55,333	51,208
Roxburgh, Berwick, and Selkirk (and counties of)	91,959	52	17,366	17,227	18,014	20,999	20,714	19,642
Eastern hospital region:								
City of Dundee	177,890	86	32,589	36,989	39,745	46,849	47,110	43,638
Angus (county of)	93,018	43	18,179	18,140	19,574	21,478	21,870	21,328
Perth and Kinross (and counties of)	130,861	73	22,103	22,169	23,919	26,025	26,673	24,630
North-eastern hospital region:								
City of Aberdeen	181,923	82	44,261	45,339	43,309	57,070	56,221	53,304
Aberdeen and Kincardine (counties of)	171,968	87	34,561	35,663	36,406	39,068	37,402	38,261
Banff and Moray (counties of)	104,831	65	29,116	30,072	31,395	32,726	33,007	33,027
Orkney (county of)	20,792	18	3,681	3,409	3,797	4,289	4,184	4,067
Zetland (county of)	19,163	14	2,223	2,247	2,250	2,200	2,520	2,668
Northern hospital region:								
Inverness (and county of)	78,743	53	11,418	11,753	11,305	12,618	12,439	11,546
Caithness (county of)	22,416	11	3,894	3,865	4,002	4,351	4,126	4,316
Ross and Cromarty (counties of)	59,401	40	9,980	9,957	10,599	10,938	11,762	11,572
Sutherland (and county of)	13,352	11	1,976	2,085	2,038	2,298	2,118	2,079

is not an overestimate can be deduced from the fact that vitamins account for at least 5% of the total annual expenditure on drugs, which was well over £40,000,000 in 1951, giving a figure in excess of £2,000,000. It is probable that only a very small proportion of the vitamin prescriptions representing this vast sum serve any very useful purpose, especially as cod-liver oil and orange juice for babies and expectant mothers are issued at antenatal and child welfare centres and do not appear on Form E.C.10. When it is recalled that, owing to the present financial position of the country, health centres cannot be built and that all hospital boards are being faced with serious difficulties as regards the staffing and general administration of their hospitals, these figures applied to vitamins alone, quite apart from other placebo prescriptions, deserve serious consideration.

In the English survey it was noted that liver extracts were ordered 50 times, in comparison with only 68 prescriptions for insulin. As the megaloblastic anaemias are relatively uncommon in comparison with diabetes mellitus it was concluded that liver extract was often used for its questionable general tonic rather than for its haemopoietic properties or for anaemias other than megaloblastic, for which it could be of no service. The present survey gave even more striking figures in this respect, for it showed that liver extract was ordered 125 times, in comparison with only 97 prescriptions for insulin and 134 for digitalis. Further, folic acid was ordered 32 times. When it is recalled that this drug should be used only in tropical sprue and in some rare cases of megaloblastic anaemia, such as the megaloblastic anaemias of the malabsorption syndrome and pregnancy, and that it is absolutely contraindicated in pernicious anaemia, some 3,000 prescriptions for it a month in Scotland would seem to be excessive.

It has been suggested from time to time by lay members of executive councils that quantities of expensive toilet requisites are commonly prescribed on Form E.C.10. This survey did not suggest that there was any justification for such strictures.

Factors Influencing Prescription Rates

The interest of these various findings should not divert attention from the more fundamental fact, demonstrated in Table I, that there is a remarkable variation between the different areas in the number of scripts (E.C.10 forms) issued per unit of population, although there is generally not much variation in the type of drug prescribed (Table II). It was realized that the figures for October alone might not give a truly representative picture of prescribing practice. Consequently the information shown in Table III for the months of July to December, 1951, inclusive was obtained. It will be noted that the number of scripts issued in October, which was chosen fortuitously for the detailed survey, was actually considerably higher than in the other months. The data collected in Table III are analysed in Table IV and in Figs. 1, 2, and 3.

Table IV suggests that there is a relationship between the script rate and the population density, though the position of Banff at the head of the list is inexplicable. The figures for population density do not take into account the uneven distribution of the population over the areas concerned. Thus in Lanarkshire there is a highly industrialized portion in the north, where the population is of almost urban density, while the remainder of the county is agricultural and sparsely populated. The same considerations apply to Fife, Dunbarton, Dumfries, and Stirling, and account for their apparently incongruous position in the Table. That there is nevertheless a definite statistical relationship between script rate and population density is obvious from Fig. 1.

Fig. 2 shows that the script rate varies with list size, and it can also be demonstrated that there is a statistical correlation between list size and population density. There is thus an intimate interrelationship between these three factors—script rate, population density, and list size.

FIG. 1.—Correlation between script rate and population density. ($Y = 225.1 + 26.9X$; $r = 0.617$; $P < 1\%$, d.f. 23.)

FIG. 2.—Correlation between script rate and list size. ($Y = 83.3 + 0.0667X$; $r = 0.7$; $P < 1\%$, d.f. 23.)

FIG. 3.—Correlation between coefficient of variation of monthly script rates with population density. ($Y = 10.44 + 2.75X$; $r = 0.83$; $P < 1\%$, d.f. 23.)

TABLE IV

Executive Council Area	Mean Monthly Script Rate per 1,000 Population July-December, 1951 (and Standard Deviation)	Population Density per Acre	Average List Size
Banff*	301 (18)	0.14	1,614
Aberdeen	269 (35.2)	17.47	2,220
Glasgow	262 (33.6)	28.21	2,078
Fife	251 (20.7)	0.96	2,455
Dunbarton	242 (32.2)	1.06	2,520
Dumfries	241 (28.9)	0.13	2,180
Lanark	238 (27.8)	0.98	2,500
Stirling	230 (27.7)	0.70	2,370
Dundee	230 (32.4)	14.57	2,069
Ayr	230 (16.4)	0.45	2,255
Edinburgh	218 (28.4)	14.42	1,801
Angus	216 (18)	0.18	2,165
Aberdeen county	215 (9.8)	0.12	1,977
Renfrew	212 (27.7)	2.27	2,375
Roxburgh	206 (18.1)	0.10	1,769
Lothians	205 (17.9)	0.38	2,355
Argyll	188 (10)	0.04	1,240
Orkney	187 (16.1)	0.09	1,175
Perth	185 (14.6)	0.08	1,792
Ross	182 (12.9)	0.03	1,480
Galloway	182 (15.1)	0.07	1,742
Caithness	182 (9.3)	0.05	2,038
Sutherland	157 (8.3)	0.01	1,214
Inverness	151 (7)	0.03	1,484
Zetland	123 (10)	0.06	1,370

* See text.

The correlation between script rate and population density is an overall relationship, since associated with population density, though not necessarily dependent upon it, are such factors as the availability of the doctor, differential morbidity, the psychological attitude of the patient to disease, and the list size. Thus in urban areas the practitioner is usually conveniently available for a consultation and a prescription, often for very trivial maladies, in contrast to the Highlands and Islands of Scotland, where moor and fen, crag and torrent, and even stormy seas may intervene between the patient and doctor. Secondly, there may be an increased morbidity in the urban as opposed to the country population. Respiratory disease, as has been noted, is an obvious example. Thirdly, as Ferguson (1945) has suggested, the industrial population, perhaps because of family tradition, trade union example, habit, and economic pressure, are possibly more likely to declare themselves unfit for work than the rural population. To a bored, disinterested workman, with an unpleasant job in squalid surroundings and in the company of uncongenial associates, a very minor disability may perhaps be a welcome pretext to absent himself from work, and prescriptions follow.

Lastly, list size has been implicated as a cause for a high script rate, and this is suggested by Fig. 2. The overworked practitioner with an excessive number of visits to make and an inflated attendance at his surgeries may well find that it takes a long time to get a full history and to make a complete clinical examination, but only a short time to write a prescription. Nevertheless it will be readily understood that script rate may be related to list size simply because the latter depends upon population density. To assess accurately the significance of list size on script rate it would be necessary to obtain the figures for script rate in large as opposed to small practices among populations of similar density, but this information is not available. By an indirect approach, however, some evidence can be obtained to suggest that list size is not at any rate the sole factor involved, and probably not the most important one.

Table III shows a considerable monthly variation in the number of scripts issued in each area, and it is apparent that the degree of variation tends to be greater where the population is dense. There can be no doubt about the significance of the correlation shown by plotting the coefficient of variation against the population density (Fig. 3). This implies that the seasonal variation is relatively greater in densely populated areas. It is improbable that this can be entirely attributable to list size, and it is more likely to be due to other factors. If among these other factors the availability of the doctor and the psychological attitude of

the industrial worker towards disease are, as has been suggested, important, then the 1s. charge on prescriptions, which has been instituted since 1951, may be justifiable as a mild mass deterrent, though it is unfortunate that it penalizes the chronic sick without greatly discouraging the hypochondriac with a passion for medicine.

Summary

A survey has been made of 18,848 prescriptions on Form E.C.10 and of 1,569 E.C.10A forms issued in Scotland during the month of October, 1951, and the general pattern of prescribing has been analysed and reviewed.

In an attempt to elucidate the factors determining prescribing rates the number of scripts issued in the 25 executive council areas in Scotland in the months of July to December inclusive was contrasted with the population density and the average list size. A considerable degree of correlation was established, and the factors concerned are discussed.

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URINARY EXCRETION OF THE PRESSOR AMINES IN RELATION TO PHAEOCHROMOCYTOMA

BY

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The presence of adrenaline-like substances in human urine has acquired importance from the increase in the number of adrenal medullary tumours diagnosed during the past three years. Of cases of hypertension it appears that a certain percentage owe their symptoms to the release of adrenaline or, more usually, to the non-methylated substance *noradrenaline*, from an abnormal adrenal gland in which the medullary tissue is greatly hypertrophied. These patients suffer from intermittent attacks of high blood pressure, but there appear to be a few in whom the pressure is also raised above the normal between the attacks (Green, 1946). The diagnosis of the presence of such a tumour is a matter of importance, since its removal is followed by a disappearance of the symptoms.

Tumours examined (Holton, 1949; Swan, 1951) usually contain excessive amounts of active material. The normal suprarenal gland in man, obtained *post mortem*, was found by West, Shepherd, and Hunter (1951) in 36 cases to contain an average of 0.2 mg. of total pressor amine per gramme. This figure may be low, as in laboratory animals it is about 1 mg./g. Tumours have been found to contain from 2 to 20 mg. of total pressor amine per gramme, and this mostly *noradrenaline*. It is not surprising that the release of some active material causes a rise of blood pressure, and theoretically it should be possible to demonstrate active material in the blood. This is, however, not easy, and Engel and Euler (1950) showed that a large amount of *noradrenaline* can be found in urine.

Holtz, Credner, and Kroneberg (1947) were the first workers to show that human urine contained adrenaline, *noradrenaline*, and hydroxytyramine. This last substance