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THE COURSE OF THE DEATH RATE FROM PEPTIC ULCER IN GREAT BRITAIN, 1912-38

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This communication is a study of the trends of the crude death rates during the period 1912-38 for peptic ulcer and for gastric and duodenal ulcer separately, in males and females, for England and Wales, London (Administrative County), Rural Districts of England and Wales, and for Scotland. There are indications that striking changes have taken place during the last 20 years of the period. The data are from the Annual Reviews of the Registrar-Generals for England and Wales and for Scotland and the Annual Reports of the London County Council. With regard to age, the number of deaths has been taken separately for the age groups 20-39 years and for 40 years and over, and the death rates calculated per million living in the age group and sex group and area concerned in the various years. The death rates have also been calculated for the total of the age groups over 20 years.

Deaths from gastric ulcer were first recorded separately for England and Wales in 1901. For duodenal ulcer, deaths were first recorded separately for England and Wales in 1911, and for London, Rural Districts of England, and Scotland in 1921; deaths had previously been included in a mixed group of diseases of the stomach or intestines, but had not been classified with ulcer of the stomach.

The Registrar-General's Return of Deaths for England and Wales also gives statistics for Urban Districts and County Boroughs. Both may be regarded as mixed urban and rural populations scattered over the country. A test of a few death rates indicates that these do not greatly differ from each other or from the rates for England and Wales as a whole, and they will not be further referred to. London's is a purely urban population, and that of Rural Districts of England and Wales is the nearest approach available to a rural population.

The statistics for peptic ulcer for London and for the Rural Districts have been recorded on three different systems between 1912 and 1937. From 1912 to 1920 gastric ulcer alone is recorded. From 1921 to 1930 there are records for both gastric and duodenal ulcer. From 1931 the only return is for peptic ulcer. Thus there is no consecutive series from 1912 to 1937. For Scotland, as for England and Wales, there are records for both gastric and duodenal ulcer since 1921.

For England and Wales and the various areas full returns are not yet available for 1938. From 1915 to 1918 the return of deaths is for civilians only, nor is the age distribution of the population generally available. Consequently this period is omitted from consideration.

The number of deaths annually in certain groups is too small to permit of more than certain general deductions. In

the group of duodenal ulcer in females between 20 and 39 years the deaths do not exceed 10 in any one year for Scotland, London, and Rural Districts, and the death rate for England does not exceed 5 per million. There is no evidence of an increase in any area. The mean of the death rates for the period 1921-30 and for 1931-7 is 5 in each instance for Scotland and 3 for England.

Tables I-III record the crude death rates per million living for England and Wales, London (Administrative County), Rural Districts of England and Wales, and for Scotland, for

TABLE I.—*Peptic Ulcer. Crude Death Rates per Million Living. From the Registrar-General's Returns*

	Population over 20 yrs.	Males			Females		
		Over 20 yrs.	20-39	Over 40 yrs.	Over 20 yrs.	20-39	Over 40 yrs.
<i>England:</i>							
1912 ..	107	129	70	197	87	67	110
1921 ..	100	143	70	210	64	32	95
1931 ..	155	252	83	407	70	17	115
1937 ..	159	260	74	423	69	10	113
<i>London:</i>							
1921 ..	117	177	84	257	65	24	108
1930 ..	211	354	130	558	92	37	155
1937 ..	208	353	84	606	87	10	150
<i>Rural Districts:</i>							
1921 ..	92	115	46	173	71	34	103
1930 ..	133	207	81	308	61	15	96
1937 ..	137	213	51	336	64	18	97
<i>Scotland:</i>							
1921 ..	134	185	85	303	88	38	146
1931 ..	181	287	116	454	88	23	147
1937 ..	209	349	122	559	86	5	155

TABLE II.—*Gastric Ulcer. Crude Death Rates per Million Living. From the Registrar-General's Returns*

	Population over 20 yrs.	Males			Females		
		Over 20 yrs.	20-39	Over 40 yrs.	Over 20 yrs.	20-39	Over 40 yrs.
<i>England:</i>							
1912 ..	80	82	43	127	77	63	94
1921 ..	72	92	44	136	55	28	82
1931 ..	105	159	49	260	58	13	96
1937 ..	107	167	46	273	54	8	89
<i>London:</i>							
1912 ..	95	120	64	186	75	47	106
1921 ..	87	119	59	172	58	20	98
1930 ..	160	244	83	390	82	31	141
<i>Rural Districts:</i>							
1912 ..	75	68	32	103	81	75	88
1921 ..	66	72	28	109	60	29	86
1930 ..	94	134	50	201	52	12	82
<i>Scotland:</i>							
1912 ..	106	110	51	178	102	70	137
1921 ..	100	129	55	215	74	31	123
1931 ..	94	122	46	195	70	18	117
1937 ..	107	155	43	259	65	1	119

TABLE III.—*Duodenal Ulcer. Crude Death Rates per Million Living. From the Registrar-General's Return*

	Population over 20 yrs.	Males			Females		
		Over 20 yrs.	20-39	Over 40 yrs.	Over 20 yrs.	20-39	Over 40 yrs.
England :							
1912 ..	27	47	27	70	10	4	16
1921 ..	28	51	26	74	9	4	13
1931 ..	46	93	27	147	12	4	19
1937 ..	50	93	28	150	15	2	24
London :							
1921 ..	30	58	25	85	7	5	9
1930 ..	53	110	47	168	10	5	14
Rural Districts :							
1921 ..	27	43	18	64	11	5	17
1930 ..	40	73	31	107	9	3	14
Scotland :							
1921 ..	34	56	30	88	14	7	23
1931 ..	86	165	70	259	18	5	30
1937 ..	102	194	79	300	21	4	36

certain years between 1912 and 1938 which specially illustrate the course. They give the total rates for both types of ulcer together—i.e., for peptic ulcer—the rates for gastric and duodenal ulcer separately, for the two sexes, and for the age groups 20-39 years, 40 years and over, and the total over 20 years. Figures 1-4 are constructed from the annual returns, and show the trends during the periods.

FIG. 1.—Peptic ulcer. Population over 20 years of age. Crude death rates per million living.

FIG. 2.—Gastric ulcer and duodenal ulcer. Males over 40 years of age. Crude death rates per million living.

FIG. 3.—Gastric ulcer and duodenal ulcer in females. Crude death rates per million living.

FIG. 4.—Gastric ulcer and duodenal ulcer. Males between 20 and 39 years. Crude death rates per million living.

These returns solely relate to death rates. Care is necessary in drawing deductions as to changes of morbidity in the living from the changes in the number of deaths and the death rates. For example, the case mortality of peptic ulcer under the age of 40 has fallen in hospitals during the last 20 years. Further, the experiences of the present war have proved that the incidence of such a serious complication as perforation may increase almost instantaneously under the influence of extremely severe stimuli, while the causes of a catastrophe such as perforation are not necessarily identical with the causes which lead to the formation of an ulcer. Nevertheless appreciable increases in the death rate of peptic ulcer over a series of years must correspond to an increase in the incidence of sickness in the community.

I. ENGLAND AND WALES

For England and Wales the crude death rate from peptic ulcer for the population of the age of 20 years and over was 107 in 1912, 100 in 1921, 155 in 1931, and 159 in 1937 (Table I). The rate was almost the same in 1912 and 1921, and was practically stationary between 1931 and 1937, though at a higher level than in 1912 and 1921; but between 1921 and 1931 there was an increase of 50%. Thus this rapid rise was followed by a stationary period and preceded by a period in which no increase had taken place. When peptic ulcer is further analysed into groups, the increase is found to be almost entirely accounted for by males over 40 years. Further, it is found that the rise in this group, starting about 1921, ceased fairly rapidly about 1930-1, and was not resumed, but that the maximum rates in 1931 were subsequently maintained.

For males over 20 years the rates show a similar trend to the total for both sexes, being dominated by deaths over 40 years, with some differences between gastric ulcer and duodenal ulcer. For males between 20 and 39 the rates are approximately the same in 1912, 1921, and 1937—viz., 70, 70, and 74; there are no great variations in the intervening years, but the rate rose to 93 in 1925 and 87 in 1928, and was about that level during this period, subsequently falling again.

For females the trends are quite different from those for males. For females of all ages over 20 years there was a sharp fall between 1912 and 1921, entirely due to decrease in gastric ulcer between 20 and 39 years. Rates are much lower than for males, and, apart from the group mentioned, changes have been small throughout the period.

It may be noted that no group of gastric or duodenal ulcer between 20 and 39 years in Britain showed a sustained increase in death rates from 1912 to 1938, except D.U. in males in Scotland—in contrast to the rises in groups over 40 years.

Gastric and Duodenal Ulcer

The death rates and the trends between 1912 and 1937 show differences between G.U. and D.U. Differences in the trends will be considered later. The rate from G.U. is approximately double that from D.U. for males throughout, and at least four times for females. The excess of deaths from G.U. is greater than can be accounted for by the higher case mortality in G.U. as shown by the results from admissions to St. Thomas's Hospital, which over a long period give 12.5% for G.U. and 10% for D.U.

It may be noted here that an excess of deaths from G.U. over D.U. is true not only for the total deaths for England and Wales but throughout the period for both sexes, both age groups, and in all areas of Britain except for males after 1927 in Scotland. It may also be mentioned that deaths from G.U. in males over 20 years exceeded those from females in England and Wales for the first time in 1914: a similar change occurred in London in 1908, Scotland (finally) in 1916, and Rural Districts in 1920. For admissions to St. Thomas's Hospital the change occurred at some date between 1913 and 1921. The excess in males has subsequently remained.

Gastric Ulcer in Males

In 1912 the total number of deaths of males over 20 years was 857, and in 1921 it was 1,011, the death rate rising from 82 to 92 per million males living in this age group—an increase of about 12% in 9 years (see Table II). Between 1921 and 1928 the death rate rose from 92 to 150, a rise of over 60%. The rapid rise then ceased, the rate being 159 in 1931 and 167 in 1937.

Death Rates Over Age of 40.—The rate in 1912 was 127, in 1921 136, in 1928 236, and in 1931 260. The rate thus increased 74% in the 7 years 1921–8 and 90% between 1921 and 1931, being preceded by an almost stationary decade between 1912 and 1921 (see Table II and Fig. 2). The rise began suddenly in 1921, was at its maximum acceleration in 1925, slowed shortly after 1928, and practically ceased after 1931, the rate in 1937 being 273. Thus the rise was also followed by an almost stationary period of years, with no fall after cessation of the rise.

Death Rates in Age Group 20–39.—The rate in 1912 was 43, in 1921 44, in 1931 49, and in 1937 46. There was a small transient rise to 59 in 1925, and the rate was 55 in 1928. This rise corresponded to the most rapid rise in death rates over 40 years, and was mainly due to the later ages in the group. The rise subsided, and the rate was approximately the same in 1912 and 1937. The trend is in contrast to that of the age group over 40 years. The ratio of the death rate over 40 years to that of the age group 20–39 was 3 to 1 in 1912 and 6 to 1 in 1937.

Duodenal Ulcer in Males

Death Rates Over Age of 40.—The rate in 1912 was 70, in 1921 74, in 1928 128, and in 1931 147. The rate thus increased 73% in the 7 years 1921–8 and 100% between 1921 and 1931, being preceded by a stationary decade between 1912 and 1921. The rise began in 1921, was at its maximum acceleration in 1925, and reached its maximum death rate of 147 in 1931. Subsequently between 1931 and 1937 there was no indication of a further rise or of a consistent rise or fall: the range was between 130 and 150. The trend of the curve resembles that for G.U. The rise proportionately is almost identical, the ratio of G.U. to D.U. being constant during the period at 1.8 to 1.

Death Rates in Age Group 20–39.—The rate may be regarded as stationary between 1912 and 1937. The rate was 27 in 1912 and 28 in 1937, the range of the rates being from 26 to 34.

Gastric Ulcer in Females

This group has certain special features. The total number of deaths of those over 20 years of age in 1912 was 897 and in 1921 705, the death rates being 77 and 55. The death rate in 1937 was 54, the range between 1921 and 1937 being 54 to 59. The number of deaths in 1912 has not been exceeded subsequently (except in 1914), in strong contrast to the course in males. The incidence in the age groups over 40 and between 20 and 39 years is so different that the total rate over 20 years is no guide to the trends.

Death Rates Over Age of 40.—The death rates in 1912 and 1921 were 94 and 82 respectively. (1921 was an exceptionally low year.) A moderate rise and fall had taken place between 1912 and 1921. After 1921 there was a slight rise of doubtful significance to 95 in 1925, and subsequently the rate remained stationary until 1937, the range being between 88 and 96. Thus the changes in rates between 1912 and 1937 were small, and between 1925 and 1937 were negligible.

Death Rates in Age Group 20–39.—The course of this group is very interesting (Fig. 3). Jennings (1940) has paid special attention to it. In 1912 deaths numbered 386 (death rate 63), being about 43% of the total of 897 over 20 years. In 1921 deaths were 175 and in 1937 were 54, the rates being 28 and 8. Between 1912 and 1937 the fall is continuous and uninterrupted, and shows no relation to the course of any other group. The death rate had been falling rapidly previous to 1912.

Deaths under 20 Years.—These form a striking illustration of the fall in incidence in young women. In 1912 they numbered 76, in 1921 24, and in 1937 only 1. Deaths under 20 years are now practically liquidated—at least temporarily—and under 40 years are nearly so.

Duodenal Ulcer in Females

The death rate from D.U. in females is low at low ages. The total deaths over 20 years in 1912 were 111, in 1921 110, and in 1937 207, the death rates being 10, 9, and 15, while in males the rates were 47, 51, and 93 respectively.

Death Rates Over Age of 40.—The rate in 1912 was 16, in 1921 13, and in 1937 24. Between 1921 and 1925 there was a moderate rise, probably significant, from 13 to 24. This corresponds with the period of maximum rise in the male group. The higher rate was maintained after 1925, but there was no further rise. The range of the death rates between 1925 and 1937 was from 19 to 24.

Death Rates in Age Group 20–39.—It has already been mentioned that the rate did not exceed 5 in any year between 1912 and 1937, and there is no indication of an increase.

Ratio of Death Rates

Males to Females.—For peptic ulcer at ages over 20 years the ratios in 1912, 1921, 1928, and 1937 were 1.5, 2.2, 3.3, and 3.8 to 1 respectively. The preponderance of males is rising rapidly.

Gastric to Duodenal Ulcers.—In the years as above the ratios of G.U. to D.U. were 3.0, 2.6, 2.2, and 2.1 to 1 respectively. The fall in the ratio in the earlier years was due to the rapid decrease of G.U. in young women. Since 1925 the ratio has been constant approximately at 2.2 to 1. For males over 40 years the ratio has been constant throughout at 1.8 to 1, and from 20 to 39 years between 1.7 and 1.8 to 1.

Remarks

In 1912 the death rates of the various groups were fairly close together, but they are now splayed out by the great increase which has taken place in certain groups since 1921 while others have remained stationary. The trend of the rates for peptic ulcer, for G.U., and for D.U. is now mainly dictated by the rates for males over 40 years.

The difference between the rates in 1912 and 1921 in all groups is small. *Male groups over 40 years*, both G.U. and D.U., suddenly began to rise in 1920–1, and for several years the rise was very rapid: it was most rapid between 1921 and 1925. After 1928 it definitely slowed down, and the rise practically ceased in 1930. The increase between 1921 and 1931 was 90% for G.U. and 100% for D.U. D.U. apparently entirely ceased to rise after 1930, but G.U. in this group may have continued to rise slowly until 1937. But, although the rise ceased, no fall followed: the maximum rate was maintained.

Rates for females have shown little tendency throughout the period either to rise or to fall, except for G.U. under 40 years. There was possibly a slight significant rise in D.U. over 40 years between 1921 and 1925 and an even smaller rise for G.U., but rates show little difference between 1912 and 1937. Gastric ulcer in females under 40 years clearly pursued a course of its own with an uninterrupted fall which had started some years before 1912. Other groups under 40 years show only slight variations throughout the period, and there is little difference in the rates for 1912 and 1937. Both

G.U. and D.U. in males had slight temporary increases between 1921 and 1925 during the sharpest rise in the later age group, and mainly due to ages near 40.

Summary

Death rates from G.U. and D.U. and in the various age and sex groups were almost the same in 1912 and 1921 (except for G.U. in females under 40 years).

In the period 1921-30 there were rapid increases in the rates for both G.U. and D.U. for males over 40. The maximum increase was between 1921 and 1925: the rise further slowed about 1928, and ceased in 1930. The rise was about 90% for G.U. and 100% for D.U.

Between 1931 and 1937 there were no further sustained changes in these groups. The maximum rates reached in 1931 were substantially maintained.

For the group G.U. in females 20-39 years the rate fell uninterruptedly from 1912 to 1937. Deaths under 20 years fell almost to zero.

In other female groups there was little change between 1912 and 1937.

Groups under 40 years, both male and female (except G.U.), showed little change between 1912 and 1937. Some groups had temporary rises between 1921 and 1925.

The ratio of the rates for males to females is rising rapidly, especially over 40 years.

The ratio of the rates for G.U. to D.U. since 1921 has been 1.8 to 1 for males and at least 4 to 1 for females.

II. LONDON (ADMINISTRATIVE COUNTY)

The total number of deaths from peptic ulcer in London in recent years has been between 500 and 650 annually, of which nearly half are in the group of gastric ulcer in males over 40 years. The numbers are small in certain groups, and vary considerably from year to year.

Gastric Ulcer in Males

In 1912 the rate from G.U. in males over 20 years was 120, and thus was considerably higher than the rate for England, which was 82. In 1921 the rate was 119, no rise having taken place. From that year the rise was rapid—mainly due to the group over 40 years.

Over 40.—There are indications that the rate was rising between 1912 and 1914, but in 1921 it was slightly lower than in 1912. From 1921 the rate rose rapidly. The trend resembles that of England, but the rates are definitely higher and the increase is greater. The rise was most rapid between 1921 and 1925, the increase, from 172 to 287, being 66%. The rate of rise was slowing after 1928, but the death rate was still increasing in 1930, when the records cease. The rate then was 390—about 50% higher than that for England. The total rise between 1921 and 1930 was 120%, the rise for England being 90%. As the rate for peptic ulcer, in males over 40, combining G.U. and D.U., rose only slightly after 1930, the rate for G.U. alone could not have greatly increased, but it may have done so in a moderate degree.

Aged 20-39.—The numbers are small. The trend closely resembles that for England, and there is a similar slight rise between 1921 and 1925. Owing to the small numbers the rates are irregular, but they are higher than those for England.

Duodenal Ulcer in Males

Duodenal ulcer was first recorded in 1921, the rates for males over 20 years being 58—half the rate for G.U. and slightly higher than the rate for England.

Over 40.—The rate rose rapidly from the first return in 1921, when it was 85, England being 70. The trend closely resembles that of England. The rise was slowing after 1925. There is no rise between 1928 and 1930—suggesting a cessation similar to that of England after 1930. The rise had then been 100%. The rates are about 20 to 25% higher than those for England, but the difference is not so great as for G.U., nor was the difference increasing so markedly between 1921 and 1930.

Aged 20-39.—The numbers are small, the range of deaths annually being between 16 and 30. No definite deductions can be made, but there are no indications of a marked rise or fall.

Gastric Ulcer in Females

The rate in 1921 for females 20 years and over was somewhat lower than in 1912, and both rates closely agree with those for England.

Over 40.—The rate rose steadily from 1921 to 1930, increasing from 98 to 141, and thus differs from that for England, which was stationary. As peptic ulcer in females, of which this group supplied 75% of deaths, had no sustained rise after 1928, the group could not subsequently have appreciably increased.

Aged 20-39.—The rates fell steadily from 1912 onwards, and were not higher, and indeed were slightly lower, than those for England. (The rate for 1930 was exceptionally high.)

Duodenal Ulcer in Females

The numbers are very small, the deaths ranging from 11 to 26. Between 20 and 39 years deaths are negligible, only one being recorded in 1928. Over 40 years, there may be a slight increase. The trends and rates do not appreciably differ from those for England.

Peptic Ulcer

The rates for peptic ulcer can be followed from 1921 to 1937. The rate for males of 20 years and over in 1921 was 177—25% higher than for England, which was 143. There was a very rapid rise between 1921 and 1925, and it continued to be rapid until 1928-30, when the rate was 354, England being 250—a difference of 40%. There was no further increase after 1930. The range from 1930 to 1937 was between 326 and 354.

Males Over 40.—The trend of the rates closely resembles that for all ages over 20 years. The rates in 1934-7 were about 600, and for England rather over 400, London being nearly 50% higher. In 1921 the rates were 257 and 210 respectively.

Males Aged 20-39.—The rates were the same in 1921 and 1937, no sustained rise having occurred, although there was an unusually high rate in 1930. The rates are about 15% higher than for England.

Females Over 40.—There was a moderate rise from 1921 to 1925, due to G.U. After 1928 there was no further increase. The rate in 1937 was 150, against 113 for England, the rates for London being about 25% higher than those for England.

Females Aged 20-39.—The number of deaths is very small in this period and the death rates are low. The rates and trend closely agree with those for England.

Ratio of Death Rates of Males to Females.—For peptic ulcer in those over 20 years the ratios in 1921, 1928, and 1937 were 2.7, 3.5, and 4 to 1 respectively, and are somewhat higher than those for England.

Ratio of G.U. to D.U.—The ratio was 2.8 to 1 in 1921 and 2.4 to 1 in 1928. For males over 40 the ratio in 1921, 1925, and 1928 was 2.0 to 1. The numbers under 40 years are too small to give the ratio.

Remarks

London has a higher death rate from peptic ulcer than England, and has had a greater rise since 1921. The excess is shown by all groups over 40 years, but is greater for G.U. than D.U., for both males and females, so far as the records are available. Groups aged 20-39 show no great differences from those for England, but G.U. in males is somewhat higher. In general trend the rates over 40 years resemble those for England. There is a similar absence of rise between 1912 and 1921 (for gastric ulcer), a rise at its maximum between 1921 and 1925, and a cessation of further rise after 1930 with maintenance of the highest rates.

Summary

The crude death rates for peptic ulcer, both males and females, between 1921 and 1937 for London were higher than for England, and rose more rapidly between 1921 and 1930.

The rate for G.U. in males was the same in 1912 and 1921.

Between 1921 and 1930 there were rises in all groups over 40 years except D.U. in females. The rate for G.U. in males rose 120%, and in 1930 was 50% higher than for England. D.U. in males rose 100%, and in 1930 was about 25% higher than for England. G.U. in females rose 40%, and in 1930 was that proportion higher than that for England, which had remained stationary.

Rises were greatest between 1921 and 1925, and slowed between 1928 and 1930. Subsequently there was no substantial rise, but the rate for males over 40 years may have increased to a small degree.

For groups aged 20-39 the rates and trends do not differ greatly from those for England. G.U. in males rose slightly and in females fell consistently. D.U. showed little change. Numbers are small.

London resembles England in the general trend of the rates, except for G.U. in females over 40 years. London differs from England quantitatively in that the rates over 40 years are appreciably higher than for England, the excess being greater for G.U. than for D.U., and greater for males than for females. The differences increased between 1921 and 1930. The ratio of males to females is higher for London.

III. RURAL DISTRICTS OF ENGLAND AND WALES

The trend of the death rates for Rural Districts in general resembles those for England and for London. Thus the rate for G.U. in males is the same in 1912 and 1921. Between 1921 and 1930 there are rises, in male groups over 40 years, which are most rapid between 1921 and 1925. After 1930 the groups show no consistent rise or fall, except that the rate for males over 40 years may be slowly increasing, probably due to G.U., which was still rising slowly in 1930, while D.U. apparently had become stationary. The group of G.U. in females aged 20-39 falls. Other groups for females, and other groups in ages 20-39 years for both sexes, show little change between 1912 and 1937, with some moderate exceptions similar to those occurring for England. While such trends are similar, there are certain considerable quantitative differences between Rural Districts and England and London, especially the last-named.

Gastric and Duodenal Ulcer in Males Over 40 Years

For gastric ulcer the rate in 1921 was 109 and in 1930 201, a rise of 85%, compared with 90% for England and 120% for London. The rate of 201 in 1930 compares with 260 for England and 390 for London, and is thus 25% below that for England and little more than half that for London.

For duodenal ulcer the position is not dissimilar, but differences in rates are smaller. The rise between 1921 and 1930 was nearly 70%, compared with 100% for England and London. The rate of 107 in 1930 compares with 150 for England and 168 for London.

Aged 20-39.—Numbers are small, but the rates are consistently below those for England and London. There are slight rises in rates between 1921 and 1925, as for England, but otherwise no material change.

Gastric Ulcer in Females

Over 40 Years.—The rate is unchanged between 1912 and 1930, resembling the trend for England, so far as records are available, but at a slightly lower rate. There is no indication of the rise which occurred in London between 1921 and 1930.

Aged 20-39.—The rates fell regularly, but this group differs from all others in that the rates for Rural Districts, though low, are higher than for England and for London. In 1912 the respective rates were 75 for Rural Districts, 63 for England, and 47 for London. The average for the years 1921-8 is 25, 21, and 16 respectively. Although the differences are not great, they are constantly present, and it is also noticeable that the rates for London are somewhat lower than those for England.

Peptic Ulcer

The rates for peptic ulcer are available up to 1937. They are consistent with the trend of the rates for G.U. and D.U. separately in 1930—viz., that G.U. in males over 40 years might be slowly rising and other groups were stationary. The rates for females at 20-39 years, which must be nearly all G.U., are still higher than for England and London, the average for 1931-7 being 22 for Rural Districts, 14 for England, and 15 for London.

Ratio of Death Rates of Males to Females.—For peptic ulcer over 20 years the ratios in 1921, 1928, and 1937 were 1.6, 2.3, and 3.3 to 1 respectively, and are lower than for England.

Ratio of G.U. to D.U.—The ratio was 2.5 to 1 in 1921 and 2.3 to 1 in 1928. For males over 40 years the ratios in 1921, 1925, and 1928 were between 1.7 and 1.8 to 1. The constancy of this ratio for males over 40 years may be noted. It was unchanged for England from 1921 to 1937 at 1.8 to 1, and also at 20-39 years almost at the same ratio. It was constant for London from 1921-8 at 2 to 1.

Summary

The death rates from peptic ulcer, especially for males, in Rural Districts are lower than for England and greatly lower than for London.

The trends of the rates do not greatly differ from those for England.

For males over 40 years the rate for G.U. in 1930 was 25% less than that for England and about half that for London. The rate for peptic ulcer was closely similar, and remained so up to 1937.

The rates in groups for females in general are slightly lower than for England.

The rates in groups 20-39 years also are slightly lower than for England.

G.U. in females of 20-39 is an exception, as the rates, though low and falling, are consistently higher than those for either England or London from 1912 to 1937.

The ratio of males to females is lower than for England and considerably lower than for London.

The ratio of G.U. to D.U., where available, was constant at 1.7 or 1.8 to 1 and the same as for England.

IV. SCOTLAND

The trend of the death rates in Scotland affords additional evidence of the rapid changes in the incidence of peptic ulcer which have taken place since 1921, but there are certain differences from the areas so far discussed.

The death rate from G.U. over 20 years of age for both sexes in 1912 was 106, and was thus considerably higher than that of England, which was 80, London being 95. Between 1912 and 1921 there was little change. In 1921 the ratio of deaths from G.U. to D.U. was 3 to 1, England's being 2.5 to 1.

The death rates from peptic ulcer over the age of 20, available from 1921 onwards, are higher throughout than for England. The rates in 1921 and 1937 were 134 and 209, and in England 100 and 159. In 1921 the rate in each age group and sex group of G.U. and D.U. was higher than in the corresponding group for England. It was also higher than in the corresponding group for London, except for D.U. in males, in which the rates were the same. Subsequently the trends for males widely differ.

Gastric Ulcer in Males over 40.—In 1912 the death rate was 178. In 1921 it had risen to 215. (In this year D.U. was introduced into the statistics.) From 1921 the rate fell slowly to about 200 in 1931. In 1934 the rate began to rise again, and was rising sharply in 1937, when it was 259, and in 1938, when it was 267. The course is in marked contrast to England (and London), in which there was a rise of 90% between 1921 and 1931, and subsequently only a slight rise between 1931 and 1937.

Duodenal Ulcer in Males over 40.—The rate rose rapidly from the first return in 1921, which was 88—somewhat higher than the rate for England and the same as for London. Between 1921 and 1931 the rate was almost tripled, rising from 88 to 259. There was a constant increase in the rate between 1921 and 1928. Subsequently between 1931 and 1938 there was no further sustained rise, the rate in 1938 being 262. The range in this period was between 241 and 300.

This course is in marked contrast to G.U. in males over 40, and the D.U. curve crosses the G.U. curve in 1928. After diverging widely the rates were equal again in 1938. Compared with England, the rise between 1921 and 1931 is more than double, but in both there was no sustained rise after 1931. The rates rise above those for London after 1925.

G.U. in Males Aged 20-39.—The rates show only small changes between 1912 and 1938, and the trend resembles that for England.

D.U. in Males Aged 20-39.—The rate in 1921 was 30—somewhat higher than for England and London. From 1921 the rates rose proportionately rapidly until 1928, when the maximum of 82 was reached. Subsequently most of the rise was maintained. This is the only group of 20-39 years in which a sustained rise has occurred since 1912. The numbers are small and the increase is mainly accounted for by ages near 40 years, but the rise between 1926 and 1928 is apparently significant.

G.U. in Females Over 40.—The course shows some transient rises, but tended to fall slowly between 1912 and 1938. The rates are considerably higher than for England, but about 1926 were exceeded by those for London, which were then rising.

Gastric Ulcer in Females Aged 20-39.—The rates fall continuously, as in areas already discussed.

Duodenal Ulcer in Females.—Over 40 years the numbers are small. There may have been a slight rise. For ages 20 to 39 the numbers are negligible.

Peptic Ulcer Over 20.—The rates are higher than those for England. They were closely similar to London's in 1921 and 1937, but the trends were different during the period. The rates rose rapidly until about 1928, then more slowly until 1934, and then again rapidly. The curve is clearly composite.

Ratio of Death Rates of Males to Females.—For peptic ulcer at ages over 20 years the ratios in 1921, 1928, and 1938 were 2.1, 2.5, and 3.7 to 1 respectively.

Ratio of Death Rates of Gastric to Duodenal Ulcer.—The ratios for males over 40 years in 1921, 1928, 1931, and 1938 were 2.5, 1, 0.75 and 1 to 1 respectively.

Remarks

The death rates from peptic ulcer are higher than for England throughout the periods for which returns are available. The rates are slightly lower than for London, but appreciably higher than for Rural Districts of England. The excess was shared in 1921 by G.U. and D.U., but later was due entirely to D.U., G.U. having fallen behind England. There was a rapid rise between 1921 and 1938, as in England, but with considerable differences in the contributory groups. For G.U. in males over 40 the contrast between the courses in England and Scotland is striking. For D.U. in males over 40 both countries show a rapid rise between 1921 and 1931 and subsequently a stationary period until 1938, but the rise in Scotland was double that in England. The death rate for this group in 1921 was only 88, and it is unlikely that it had been rising rapidly previously. The trend for G.U. in females under 40 resembles that for England.

Summary

Death rates from peptic ulcer over 20 years increased rapidly between 1921 and 1928, more slowly to 1934, and rapidly again to 1938. The rates are higher than for England and appreciably higher than for Rural Districts, and usually slightly below that for London. The trend differs from that for England.

G.U. in males over 40 rose between 1916 and 1921. There was no further rise until 1934, when the rate rose rapidly until 1938. The trend is in marked contrast to those of England, London, and Rural Districts. The rates for G.U. in males under 40 have shown no material change, and resemble those for England.

D.U. in males in 1921 had approximately the same rate as in England and London. The rate rose very rapidly from the first records. For the group over 40 it had nearly tripled by 1931, the rise being greatly in excess of that for England; it then became practically stationary until 1938, as in England. The curve crossed that for G.U. in 1928, but after diverging widely the two rates were practically equal again in 1938.

D.U. in males under 40 rose between 1921 and 1928. The rates are higher than in England and London. The numbers are small.

G.U. in females over 40 shows no sustained rise between 1912 and 1938. The group under 40 has fallen continuously.

D.U. in females gives no indications of a material increase.

All rises which took place over a course of years were subsequently maintained, no material fall taking place.

V. GENERAL REMARKS

No attempt is made here to consider fully the causes of the trends of the death rates, but attention may be directed to certain points, further study of which might assist in elucidating the predisposing causes of peptic ulcer.

Trends in Males over 40.—The curves for England, London, and Rural Districts possess the same general characteristics. Between 1914 and 1921 there is no material rise. From 1921 to 1925 there is a rapid rise, which slows from 1925 or 1928 to 1930. Subsequently the rate is practically stationary. G.U. may be rising slowly, but there is a change about 1930 similar to that for D.U., but not so complete. The contrast between 1921–30 and 1931–7 is definite. The maximum rates reached about 1930 are substantially maintained. These trends could be explained by new factors, introduced in 1921, reaching their maximum effect about 1930. The possibility that the rises are due to improved diagnosis and recognition is negated by the

rates for women and for ages under 40, which show no similar increases and are mostly unchanged throughout the period.

The rate for D.U. in Scotland in 1921 was close to that for England and for London. Between 1921 and 1930 the rise was twice as great as for England. Subsequently the rate became stationary, as in England. The differences are quantitative.

For G.U. in Scotland, the difference from England is not merely quantitative, as there is a complete absence of rise between 1921 and 1934. The possibility of mass differences in diagnosis is negated by the curve for peptic ulcer, combining G.U. and D.U. This is quite different from that for England and English areas, and is clearly a composite curve.

Gastric Ulcer in Females Aged 20–39.—The rates fall continuously, the trends being the same for England, English areas, and Scotland. The rates are highest in Rural Districts. These trends point to the existence of and disappearance of external factors, acting as predisposing causes of the mass production of a certain group of peptic ulcer. This does not exclude the possibility of psychological stimuli acting as exciting factors.

Peptic Ulcer in Other Groups of Ages 20–39.—There is little change in all other groups of these ages. Death rates will be affected by the reduction in case mortality which has taken place at these ages since 1921, but it would be curious if this so exactly balanced any great rise in morbidity.

Peptic Ulcer in Females.—There has been no significant rise, except for G.U. over 40 years in London over a limited period.

General Summary

Calendar Periods.—(a) Between 1912 and 1920 there was little or no rise in rates for peptic ulcer, or for the various groups where returns are available; (b) between 1921 and 1930 there was a rapid rise in many groups; (c) between 1930 and 1938 there was little or no further rise. The maximum rise was between 1921 and 1925, the rate of increase diminishing after 1925 to 1928 or 1930. The only definite exception to the above is G.U. in males over 40 in Scotland.

Absence of Falls after Rises.—Rates which rose were subsequently maintained at the maximum level.

Age Incidence.—Rises are almost confined to age groups over 40 years. Age groups under 40 years show little change between 1912 and 1938.

Sex Incidence.—(a) The rates for females, both over and under 40, have shown little or no tendency to rise between 1912 and 1938. (b) G.U. in females under 40 has fallen to a very low rate, in continuation of a decrease which began in previous decades. The ratio males to females has consequently been rising rapidly.

The rise in rates for peptic ulcer for the population over 20 years has thus been due almost entirely to males over 40.

Gastric and Duodenal Ulcer.—The death rate for G.U. throughout the period is considerably in excess of that for D.U. for both sexes and age groups and all areas, except for males in Scotland after 1927. Gastric ulcer showed a slow rise up to 1938 in males over 40 in England. The rise was rapid in the last few years in Scotland. For duodenal ulcer the rate became practically stationary in all age and sex groups and all areas after 1930.

Areas.—Death rates for peptic ulcer are highest in London, slightly lower for Scotland, lower for England, and lowest for Rural Districts of England. These differences are mainly due to rates for males over 40. Differences are slight for males under 40 and for females, in which groups rates are low. *Scotland:*—The trend of the rates for G.U. in males over 40 is entirely different from those for England and constituent areas of England. For D.U. in males over 40 the rise was extremely rapid between 1921 and 1931. *Rural Districts:*—The rates for males over 20 are approximately 60% of those for London and Scotland and 80% of those for England.

REFERENCE

Jennings Denys (1940). *Lancet*, 1, 395.

The March–April issue of *Industrial Welfare and Personnel Management*, the journal of the Industrial Welfare Society, contains an article on industry and rehabilitation by Dr. Harold Balme, medical officer in charge of rehabilitation, Ministry of Health, reviewing the work and progress of the movement, especially the part dealing with injuries which need not necessarily be permanent. Another article, on modern trends in industrial welfare, is by Sir Stafford Cripps, who discusses the modern conception of welfare based on the twofold contribution it can make to the social well-being of the worker and to efficiency of production.