THE ECOLOGY* AND CONTROL OF GONORRHOEA†

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Gonorrhoea in adults is an endemic infection, subject at times to epidemic increases due to environmental factors which are largely uninfluenced by our routine control measures of prompt diagnosis and treatment of patients, and contact tracing. The limitations of contact tracing are well recognized. The Annual Report of the Chief Medical Officer for 1955 (Ministry of Health, 1956), stated that there had been no appreciable improvement in the control of gonorrhoea in the preceding 5 years, and since that time the number of infections treated at the clinics has increased significantly (see Table II, below). Moore (1957) stated that no noteworthy progress had been made in the control of gonorrhoea or was even in sight. Furthermore, the recent reports of diminishing sensitivity of the gonococcus to penicillin in certain areas (Curtis and Wilkinson, 1958; Cradock-Watson, Shooter, and Nicol, 1958; W.H.O. Seminar, 1958; Reyn, Korner, and Bentzon, 1958) must give venereologists, public health officers, and sociologists cause to think.

Before accepting outright the pessimistic premise that the best we can hope for, in the control of gonorrhoea, is to hold its incidence at an irreducible minimum, we have felt the need for a full reappraisal of the whole situation. We have used a wide ecological approach, taking our definition of ecology as the dynamics of epidemiology. The latter is largely descriptive and static, while ecology has a wider connotation which includes the consideration of man's interaction over the years with his physical and social environment. Thus we have tried to look

beyond the bare figures of incidence to the geographical, racial, socio-economic, and other factors which influence past, present, and future trends. This may indicate the directions in which further control efforts may profitably be made.

Geography

International.—Reported new cases of gonorrhoea in various countries have been collected by the World Health Organisation (Table I, overleaf). These figures do not permit the comparison of the incidence in one country with that in others, because the arrangements for the treatment of gonorrhoea, the influence of private practitioner treatment, and other factors including the provisions for the notification of V.D. vary considerably throughout the world. It is possible, however, to study the trend in individual countries; all reveal a high incidence in the years immediately following the second world war with a steady fall thereafter. Since about 1951–52 this fall has levelled off, and in some countries there has recently been a tendency for the incidence of gonorrhoea to rise again.

National.—The number of new gonococcal infections treated in the V.D. centres of England and Wales is shown in Table II (overleaf). It should be emphasized that these figures refer to the diagnosis of *infections* rather than to individual *patients*; thus one promiscuous male having six attacks of gonorrhoea in one year would account for six infections in the national total. For this reason it is theoretically possible that, although the national total of infections diagnosed in a given year may show an increase, fewer individuals may in fact have contracted gonorrhoea during the same period. Such a possibility has been encouraged

* *Ecology*, Oecology, n. Branch of biology, dealing with living organisms' habits, modes of life, and relations to their surroundings (Gk. *oikos*, house.) (Concise Oxford Dictionary.)

† Received for publication January 7, 1959.

TABLE I

REPORTED NEW CASES OF GONORRHOEA IN BOTH SEXES, BY YEAR, 1948 TO 1957
(Compiled mainly from W.H.O. Epidemiological and Statistical Reports 1954 and 1958)

Country		Year									
		1948	1949	1950	1951	1952	1953	1954	1955	1956	1957
Germany ..	East Berlin	—	—	—	—	—	5,380	5,480	5,166	4,163	—
	West Berlin	—	8,111	6,576	5,824	—	—	—	—	—	—
	Democratic Republic ..	35,224 ^a	31,528 ^a	27,945 ^a	30,131 ^a	38,939 ^a	38,450	34,534	31,524	28,906	—
	Federal Republic ..	133,707	100,948	74,803	54,138	48,067	47,344	34,443 ^b	—	—	—
Austria		11,213	7,051	5,603	4,603	3,857	3,770	3,853	3,809	3,618	3,866
Belgium		1,195	751	542	595	633	605	592	541	475	432
Denmark		12,891	11,170	8,485	7,093	7,017	7,551	8,215	8,129	7,665	7,430
Spain ^c		7,984	7,736	7,097	7,259	5,948	5,399	4,978	—	—	—
Finland		12,461	8,498	6,629	5,806	5,022	5,187	5,685	5,612	4,720	4,616
France ^c		24,257	21,324	17,888	14,664	15,098	16,151	15,959	17,150	16,682	—
Iceland		543	375	208	220	246	272	476	—	—	—
Italy ^{d c}		2,054	1,882	1,118	1,237	1,420	1,285	1,007	839	779	868
Luxembourg		385	241	321	233	238	238	198	148	172	140
Norway		5,094	3,426	2,415	1,947	1,933	1,647	1,560	1,866	2,002	1,914
Netherlands ^c		3,863	2,990	1,769	1,751	1,069	1,271	1,174	—	—	—
Portugal—Mainland ^e		—	—	933	1,447	872	813	1,050	1,006	688	575
United Kingdom	England and Wales ^c	30,312	24,487	20,504	18,064	19,095	19,263	17,536	17,845	20,388	24,381
	Scotland ^c	4,909	3,837	3,081	2,752	2,863	3,251	2,798	2,545	2,708	—
Sweden		10,512	9,743	10,212	13,294	14,963	14,052	13,717	13,852	13,710	12,734
Yugoslavia		—	16,668	13,585	14,616	14,549	11,848	13,385	14,673	—	—
Canada		18,547	17,439	16,106	14,341	14,416	15,290	—	—	—	—
U.S.A.		345,501	317,950	286,791	254,057	245,045	238,340	—	—	—	—
Japan		219,745	178,901	178,273	179,116	158,670	140,458	—	—	—	—
Poland (per 10,000 population)		18.0	13.0	12.64	13.42	14.20	14.59	14.34	14.76	—	—

^a. Including East Berlin up to 1952.

^b. Excluding Schleswig-Holstein and Bayern.

^c. Cases treated in venereal disease treatment centres.

^d. Cases notified in some circumstances only.

^e. Incomplete or preliminary figures.

— Data not yet available.

TABLE II

CASES OF GONORRHOEA DEALT WITH FOR THE FIRST TIME IN THE TREATMENT CENTRES OF ENGLAND AND WALES, BY YEAR AND SEX, 1932 TO 1958

Year	Males	Females	Year	Males	Females
1932	28,179	7,677	1945	21,280	11,603
1933	29,169	8,583	1946	36,912	10,431
1934	28,787	8,199	1947	29,647	7,019
1935	27,506	7,732	1948	25,006	5,306
1936	28,137	7,715	1949	20,366	4,121
1937	29,250	7,787	1950	17,007	3,487
1938	27,947	7,746	1951	14,975	3,089
1939	24,811	6,489	1952	15,510	3,585
1940	21,057	5,882	1953	15,242	4,021
1941	20,572	7,314	1954	13,962	3,574
1942	17,956	8,413	1955	14,079	3,766
1943	18,215	10,043	1956	16,377	4,011
1944	16,629	10,646	1957	19,620	4,761
			1958	22,407*	5,508*

* Provisional figures calculated from the quarterly figures for 1958.

in the past 15 years by the rapid cures effected by penicillin.

Between 1932 and 1938, the annual incidence of gonococcal infections in the male remained remarkably stable. From 1939 to 1945 inclusive, the figures for gonorrhoea in the male, referring only to civilian cases, and excluding the numerous infected servicemen of many nationalities, represent very inadequately the real prevalence of gonorrhoea in the turbulent years of the second world war. The steady increase in civilian females treated for gonorrhoea from 1941 to 1945 inclusive, is a truer, albeit minimal, index of the great increase in venereal disease which occurred because of war conditions. The post-war peak in the curve of gonococcal infections occurred in 1945 for women and in 1946 for men; the

great increase in civilian males treated for gonorrhoea in 1946 coincided with large-scale demobilization of servicemen and need occasion no surprise. After this the curve for both sexes dips steadily, but this downward trend ceases after 1951. Apart from 1954, which has the lowest totals recorded for more than a generation, the curve has since risen steadily. In spite of the present rising trend it is well to appreciate the gains achieved; thus the average figure for gonorrhoea in the male for the quinquennium 1952-56 is 15,034 compared with 28,356 for 1932-36, a decrease of 47 per cent. For the female, the corresponding figure is 3,791 compared with 7,981, a decrease of 52 per cent. It might seem, therefore, that we are about twice as well off in the present penicillin era as in the pre-sulphonamide years. However, the simplicity of administration and the success of penicillin and the tetracyclines may well have encouraged the general practitioner to take a greater share in treating gonorrhoea in recent years. That a not insignificant proportion of V.D. is treated outside the V.D. Clinics is suggested by the findings of a recent inquiry conducted jointly by the British Medical Association and the Medical Society for the study of Venereal Diseases (Ministry of Health, 1958; British Cooperative Clinical Group, 1959.)

Regional.—Table III gives the number of gonococcal infections treated since 1948 in the clinics of the city of Manchester and in the peripheral clinics serving the area of the Manchester Regional Hospital Board. The geographic and socio-economic features of this area have been described elsewhere (Laird, 1957). It will be noted (Table III) that the annual total for gonorrhoea in males in the city clinics of Manchester was lowest in 1954 and that there have been significant increases during 1957 and 1958. The figure for 1958 exceeds by 590 (33 per cent.) that for 1954, and is only 315 (15 per cent.) less than that for 1948. The 1958 total for gonorrhoea in males in the

peripheral clinics is higher by 174 (28 per cent.) than in 1954, but still 59 per cent. lower than the large total for 1948. Again, though the male infections diagnosed in the city of Manchester in 1949 were twice as many as the total for the peripheral clinics, the ratio has now increased to 3:1; for female cases the ratio has also increased from 3:2 in 1949 to almost 3:1. It seems clear, therefore, that more progress in the reduction of gonorrhoea in the male has been achieved in the smaller towns served by the peripheral clinics than in the city of Manchester itself. Table IV, which gives the figures for cases of gonorrhoea treated in the city clinics of Manchester during the past 30 years, shows that extremely little reduction has been achieved; excluding the post-war peak years 1945-48 inclusive, the annual number of infections in males was greater in 1958 than in any year since 1931. This situation in Manchester may be a little less serious than the figures indicate as in recent years re-infections have been recorded more carefully, and Watt (1958) has shown the size of the "repeater" problem in the city clinics of Manchester. He found that, during 1955-56, almost 20 per cent.

TABLE IV
NEW CASES OF GONORRHOEA TREATED ANNUALLY IN THE CLINICS OF THE CITY OF MANCHESTER, BY YEAR AND SEX, 1929 TO 1958

Year	Males	Females	Total	Year	Males	Females	Total
1929	2,122	428	2,550	1944	1,270	684	1,954
1930	2,028	482	2,510	1945	1,699	681	2,380
1931	1,782	450	2,232	1946	2,854	693	3,547
1932	1,549	467	2,016	1947	2,409	495	2,904
1933	1,710	482	2,192	1948	2,080	368	2,448
1934	1,568	464	2,032	1949	1,644	361	2,005
1935	1,524	455	1,979	1950	1,278	242	1,520
1936	1,481	418	1,899	1951	1,266	248	1,514
1937	1,637	380	2,017	1952	1,475	444	1,919
1938	1,780	390	2,170	1953	1,214	348	1,562
1939	1,587	365	1,952	1954	1,175	314	1,489
1940	1,366	365	1,731	1955	1,345	365	1,710
1941	1,421	373	1,794	1956	1,283	343	1,626
1942	1,282	503	1,785	1957	1,557	393	1,950
1943	1,357	647	2,004	1958	1,765	455	2,220

TABLE III
INCIDENCE OF GONORRHOEA IN THE MANCHESTER REGION, BY YEAR AND SEX, 1948 TO 1958

Year	Area								
	Manchester Clinics Only			Peripheral Clinics—Manchester Region			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
1948	2,080	368	2,448	1,103	240	1,343	3,183	608	3,791
1949	1,644	361	2,005	862	232	1,094	2,506	593	3,099
1950	1,278	242	1,520	707	178	885	1,985	420	2,405
1951	1,266	248	1,514	577	156	733	1,823	404	2,227
1952	1,475	444	1,919	696	185	881	2,171	629	2,800
1953	1,214	348	1,562	544	150	694	1,758	498	2,256
1954	1,175	314	1,489	453	119	572	1,628	433	2,061
1955	1,345	365	1,710	493	134	627	1,838	499	2,337
1956	1,283	343	1,626	447	123	570	1,730	466	2,196
1957	1,557	393	1,950	502	143	645	2,059	536	2,595
1958	1,765	455	2,220	627	185	812	2,392	640	3,032

of male cases of gonorrhoea returned in the same year with one or more re-infections. The corresponding figure at St. Luke's Clinic, Manchester, for female cases of gonorrhoea is about 10 per cent. The gonorrhoea study of the British Co-operative Clinical Group (1956) recorded a re-infection rate of 10·4 per cent. for males and 7·3 per cent. for females in 1954; the figures given by Watt (1958) suggest that the "repeater" problem may well be increasing. It certainly is greater in cities than in the smaller towns; in three clinics on the periphery of Manchester the rate for males between 1952-57 averaged only 8 per cent. compared with 20 per cent. in the city clinics of Manchester.

During 1958, gonorrhoea was diagnosed in 41 per cent. of all new male patients in the city clinics of Manchester, while the corresponding proportion in the peripheral clinics of the Region was only 25 per cent. These figures illustrate the point that has been made elsewhere (Laird, 1958), that gonorrhoea is essentially a disease of the major cities and of the promiscuous, flourishing best where the availability of work has attracted young men from distant homes to congregate. This is especially so with men from countries where race (West Indies and West Africa), or tradition (Eire) militate against stable friendships leading to early marriage. These influences have been discussed more fully in relation to the differences in the ratio of gonorrhoea to non-gonococcal urethritis in various racial groups (Laird, 1958). It is in such large cities, too, that the "reservoir" of latent gonococcal infection (Nicol, 1956) exists in a small but promiscuous section of the female population.

In the smaller peripheral clinics a significant proportion, or even a majority, of male patients with gonorrhoea has not been infected locally, but in the adjoining city or some other large urban centre (Table V).

It seems clear, therefore, that the national figures portray only an incomplete picture; improved

control of gonorrhoea in the smaller towns and rural areas being offset or indeed obscured by lack of progress or actual deterioration in the major cities.

Race

Foreign nationals and Commonwealth immigrants concentrate in large cities because there the opportunities for work, business, and education are greatest. In general, these non-native residents are young, unmarried, and plan or hope to return to their own countries in due course. For these reasons, as well as that of colour, integration with the local community is rare, and stable sexual relationships are seldom established (Laird, 1958). It is almost inevitable and certainly not surprising that these men make a disproportionately large contribution to the gonorrhoea rate in big cities. In the two major city clinics of Manchester, during 1956 and 1957, men born in the United Kingdom formed only 47 per cent. of males treated for gonorrhoea, and the balance of 53 per cent. was made up of West Indians (21 per cent.), West Africans (12 per cent.), citizens of Eire (13 per cent.), and various other Europeans and Asians (7 per cent.) (Laird, 1958, Table IV and Fig. 3).

The national V.D. figures largely reflect the situation in the major cities and there is no doubt that at the present time in England and Wales the problem of gonorrhoea is inseparably associated with itinerants and coloured immigrants. Immigration, however, is not a new problem to the venereologist. For a few years after the second world war, displaced persons recently arrived from Central Europe formed a high proportion of those attending the clinics, but they are now infrequently seen there. These men, apart from the fact that they are now older, are now married and in many cases their wives are local girls. Many have become naturalized and are fully accepted at their places of employment. In effect, they have become integrated into our society, exercising full rights and privileges, and accepting responsibilities in the same way as the

TABLE V
PLACE OF INFECTION OF MALES WITH GONORRHOEA IN THREE PERIPHERAL CLINICS, BY YEAR, 1951 TO 1958

Year	Stockport			Macclesfield			Crewe			Total		
	Local	Other than Local	Un-known	Local	Other than Local	Un-known	Local	Other than Local	Un-known	Local	Other than Local	Un-known
1951	18	10	12	8	3	2	8	4	—	34	17	14
1952	33	24	2	2	3	—	2	8	5	37	35	8
1953	33	18	1	1	—	—	3	7	2	37	25	3
1954	10	25	1	1	1	1	1	4	—	12	30	2
1955	11	30	—	1	1	—	6	6	—	18	37	—
1956	19	18	4	4	2	—	—	6	—	19	26	4
1957	20	28	1	2	2	1	2	8	—	24	37	2
1958	6	23	2	—	1	—	2	5	—	8	29	2

native-born citizens. The opportunity for such integration is not available to the same extent for those coloured immigrants from West Africa and the British West Indies who might wish to settle permanently in England, although they are of British Commonwealth stock. For this reason, these men and their consorts provide a large percentage of the gonococcal infections treated in the clinics and are likely to do so for some time to come. The marital status of these men is often in doubt. Some declaring themselves as "single" admit to a "common law" wife "at home". Few have homes in Britain with wives—"common law" or otherwise—and children. Indeed, there seems to be little official encouragement, as there is for citizens of the United Kingdom going to Commonwealth countries, to emigrate with wife and family. On arrival here these coloured immigrants naturally go to our big cities in search of work. Hall (1957) has given a clear picture of the unsatisfactory and overcrowded living conditions of West Indians recently arrived in England. It is also possible that these men may be among the first to suffer unemployment during any trade recession. Although they have the rights and privileges of full citizenship, few are able to take on social responsibilities or marry local women. Like the armies of any nation stationed in another country, they tend to be a society within a society and are likely to remain so. They do not, in fact, become integrated socially. Gonorrhoea is more common in the single; little wonder then, as their sexual outlet is usually restricted to promiscuous women, that many become infected, some repeatedly so (Watt, 1958).

Lack of social integration is not confined to coloured men. It also applies generally to the young, male citizens of Eire who form a large part of the labour force in England, particularly in relation to the building industry, road works, and certain aspects of agriculture. In addition to the fact that they are itinerants, failure in social integration springs from the traditional late age of marrying of the Irishman. White, male patients from Eire are common in the V.D. clinics of Manchester, because their sexual outlet is similar to, although not identical with, that of the coloured patients from West Africa and the British West Indies. In each of these three racial groups the ratio gonorrhoea/non-gonococcal urethritis is high compared with that in native-born patients: *viz.* Eire 4.4, West Indians 3.96, West Africans 4.95 and U.K. 1.5. These ratios, which have been discussed fully elsewhere (Laird, 1958), emphasize again that the congregation in big cities away from their own homes of young single men, who for different reasons fail to marry or

otherwise establish a stable sexual relationship, favours promiscuity and a high incidence of gonorrhoea. That this may also arise in smaller towns is seen in the case of Ipswich (Table VI), where British West Indians arrived in force in 1954. They form at present some 6 per thousand of the total population and this is estimated to be below the maximum obtaining a year or two ago.

TABLE VI

NEW CASES OF GONORRHOEA SEEN IN V.D. CLINIC, IPSWICH, BY YEAR AND SEX, 1951 TO 1958

Year	New Cases of Gonorrhoea			Non-Gonococcal Urethritis	Gonorrhoea/N.G.U. Ratio
	Male	Female	Total		
1951	24	10	30	20	1.2
1952	27	14	41	37	0.73
1953	41	26	67	41	1.0
1954	52	26	78	26	2.0
1955	118	49	167	41	2.9
1956	92	58	150	40	2.3
1957	86	62	148	55	1.6
1958	75	74	149	40	1.9

Prostitution

It has been shown that gonorrhoea in the male is related to the big city and promiscuous, unstable sexual relationships. The latter encourage prostitution which can therefore only flourish in the big cities. Thus it is not surprising that prostitution is a factor in the spread of gonorrhoea. The gonorrhoea study of the British Cooperative Clinical Group (1956) showed that, in 1954, in certain large towns and cities of England, 35.7 per cent. of men with gonorrhoea had been infected by prostitutes. In the city of Manchester during 1956 and 1957, of *all* male patients seen for the first time, 34 per cent. had paid money and a further 22 per cent. had paid the woman in kind (Laird, 1958). The same Manchester study revealed that in 45 per cent. the female was met in the streets. Street prostitution, therefore, plays a significant part in the spread of venereal disease, particularly of gonorrhoea. The Wolfenden Committee recommendations were calculated to drive prostitutes from the streets and the Street Offences Bill has now become law. What results are likely to follow this new legislation? It is aimed at one of the main facilitatory processes leading to evanescent sexual liaisons, which are a major factor in the spread of venereal disease. In the past sporadic "vice drives" have certainly helped—temporarily and locally—as the prostitutes have moved on to another city or have suspended their activities for a time. Such suppressive activity, although organized and

maintained on a national scale, will not by itself abolish prostitution, as the Wolfenden Committee recognized. Prostitutes, driven from the streets, will operate from bars, clubs, cafés, and dance halls, while the more prosperous ones may well become "call-girls" individually or on an organized basis. We understand that the "call-girl" system is well developed in some cities in the U.S.A., but we know of no report which proves that this system facilitates the discovery of sources of infection. In theory, however, tracing the "call-girl" source of infection should be easier than finding the street prostitute, as the infected male should know the woman's telephone number and address. Moreover, with the "call-girl", the man must deliberately take the initiative, while with the street prostitute "spur of the moment" exposure, frequently after taking alcohol, is the rule. By making street prostitution hazardous and liable to heavy penalties, the proposed legislation may discourage young girls from taking casually to the streets, and in this way may prove an additional long-term benefit. Will the letter of the law be interpreted uniformly in all our big cities? The proposed legislation does not define a "common prostitute": how will she be identified? This cannot be done on past convictions, as the police record of the accused is not disclosed to the magistrates until after the hearing of the case. Although in the past the prostitute has usually pleaded guilty and paid the fine (maximum forty shillings), the heavier and progressive penalties envisaged may encourage her to contest the charge, and the clever defence solicitor may find remunerative work. For the new legislation to achieve its purpose, greater police activity must be supported by determined magisterial decisions. In addition, although the persistent offender sentenced to imprisonment will no doubt be investigated in prison for the presence of V.D., cannot those dismissed with a fine also be examined? Here, the more widespread use of remand in custody for a medical report under section 26 of the Criminal Justice Act, 1948, would seem desirable (Keighley, 1957). If this is not done a great opportunity will be lost, not only for the public health, but for the woman's personal health (e.g. in the prevention or treatment of salpingitis).

Alcohol

The role of alcohol in the spread of venereal disease is soon apparent to those practising venereology, and the gonorrhoea study of the British Co-operative Clinical Group (1956) showed a clear association between indulgence in alcohol and the spread of gonorrhoea. While there is, for various

reasons, less drunkenness now than formerly, only a modest consumption is required to impair the critical faculties; this impairment and the presence of promiscuous women in bars, or lying in wait outside, lead all too frequently to unpremeditated sexual exposure and venereal disease. Relatively high wages, loneliness, and lack of leisure-time interests combine to bring many to the company of Bacchus and the arms of Venus. In addition to the prostitute who demands money, some public houses are frequented by women who sell their favours for a few drinks. In the Manchester clinics, 30 per cent. of all male patients met their consorts casually in public houses (Laird, 1958).

The envisaged legislation against street prostitution may well drive more prostitutes into public houses, and increase the already significant contribution of alcohol and the public house to the spread of gonorrhoea. Häro and Pätälä (1957) have pointed out that this trend is already apparent in Finland where street prostitution appears to be decreasing. The venereologist has no direct control over these social problems, and it may well be that the problems themselves are insoluble. However, one awaits with interest the findings of the current study by the Home Office of the problems arising from excessive consumption of alcohol by the individual.

Other Socio-Economic Factors

Gjessing (1956) believes that venereal diseases increase with prosperity and decline in times of economic depression. In England, however, an increase in cases attending the treatment centres occurred during the severe economic depression of 1929-1931 (Table IV gives the figures for gonorrhoea in Manchester). King (1958) attributes the decline in venereal diseases, particularly syphilis, to improving social conditions, but believes that, in respect of the recent rise in gonorrhoea, this trend has been outweighed by coloured immigration and the fact that the gonococcus has become less sensitive to penicillin. The influence of socio-economic factors is so complex that dogmatic assumptions are best avoided. Chronic economic depression, unemployment, and shortage of houses, all contribute to interference with or postponement of marriage, thus discouraging stable sexual relationships, and lack of money brings to the clinics for free treatment those who in times of prosperity would seek private treatment. Full employment and good wages, however, favour greater consumption of alcohol, which in turn may lead to venereal infection. Since the second world war much material progress has been

achieved in England, as elsewhere, and the building of more and better homes, steady employment, and earlier marriage must undoubtedly have favoured a decline in venereal disease amongst native-born citizens (Table VII). Since 1945 a return to stability of the population in their own home surroundings must surely have been a significant factor in the dramatic decline in venereal disease during the quinquennium 1947-51, particularly in rural communities and the smaller provincial towns. The same trend probably holds true for the local inhabitants of the great cities, but is masked, in the clinic figures, by the disproportionately high number of infections in the immigrant and itinerant sections of the city's population. War, with its dislocation of family and economic stability, has always encouraged the spread of venereal diseases, and the effects of global war continue to operate for so long that it is difficult, if not impossible, to assess the influence of individual socio-economic trends during the period of post-war reconstruction. If real international peace could be achieved and maintained for more than a generation, the unravelling of the pattern would be simplified and the results would be full of interest.

The improvement in socio-economic conditions in the recent past has been largely confined to amelioration of man's material environment. Although this process solves some problems, it brings others into prominence, *e.g.* increase in the divorce rate, juvenile delinquency, and neurotic illness, in addition to prostitution, alcoholism, and drug addiction. Many see these as incurable social ills; should gonorrhoea also be so regarded?

Public Education

Public education, both in the armed forces and amongst civilians, was intensified during the second world war, and may still exert some influence. It is interesting to note that, although the number of patients with venereal disease seen at the clinics is smaller there is no corresponding reduction in the number of persons seeking examination and reassurance. Public educational activity in England

virtually ceased in 1946, and it would be difficult to develop it again; any fresh activity should be aimed at, and made appropriate for, the population groups specially concerned. Thomson (1956) found that the showing of films about V.D. in Hong Kong contributed to increased clinic attendances.

Contact Tracing

In Britain the policy of tracing alleged sources of infection has been both more vigorously and more generally pursued since the second world war. Compulsory powers, under Defence Regulation 33. B, were helpful in difficult cases (Laird, 1946) but these were withdrawn in 1947. In the past decade the Ministry of Health (Circular 5/48) has encouraged the venereologist to seek information from patients regarding their source of infection, and the employment of social workers or the help of health visitors of the medical officers of health has become more widespread. The "contact slip" (Nicol, 1954) is valuable where the male patient knows and can find his source of infection; in Manchester, the contact slip is successful in bringing the female to the clinic in about one-third of the cases in which it is issued. Case finding in general and the "contact slip" in particular are more effective in the smaller towns than in the major cities, largely because in the latter the unidentifiable or uncooperative prostitute plays a large part in the spread of gonorrhoea. Thus, in the Manchester region, the male : female ratio of new patients has improved since 1949 from 5 : 1 to 4 : 1 in the city clinics, and from 4 : 1 to 3 : 1 in the peripheral clinics. However, the contribution of contact tracing to the control of gonorrhoea is inevitably limited.

The Asymptomatic Female Carrier

Many more men than women are treated for gonorrhoea, the ratio being about 4 : 1 over the whole country (Table II). A major reason for this discrepancy between the sexes is the degree to which gonorrhoea produces symptoms. With rare exceptions the man with gonorrhoea knows that he needs

TABLE VII
MARITAL STATUS OF MALES WITH GONORRHOEA IN THREE PERIPHERAL CLINICS, BY YEAR, 1951 TO 1958

Year	Stockport		Macclesfield		Crewe		Total	
	Married	Single	Married	Single	Married	Single	Married	Single
1951	13	27	7	6	8	4	28	37
1952	25	34	3	3	8	7	36	44
1953	21	31	1	—	4	8	26	39
1954	14	22	3	—	—	5	17	27
1955	11	30	1	1	2	10	14	41
1956	13	28	1	5	3	3	17	36
1957	14	35	1	3	2	8	17	46
1958	12	19	—	1	2	5	14	25

treatment. In the female, however, the infection is asymptomatic in more than half the cases, whilst in some of those with a vaginal discharge, the nature and infectiousness of the condition is not understood by the woman. For these reasons the asymptomatic female carrier, who largely forms the "reservoir" of infection, is perhaps the most important factor preventing the control of gonorrhoea.

The Effect of Treatment

Both the sulphonamide drugs and penicillin simplified and quickened the treatment of the individual case, and encouraged hopes of controlling gonorrhoea. We believe that, as a general rule, it is reasonable to treat at the first visit a female who is considered on sound epidemiological information to be infected even if direct smear examination is negative, without awaiting the result of cultures. In addition to such "epidemiological" cases, attempts have been made to prevent re-infection of the female by combining curative doses with long-acting preparations of penicillin. Hookings and Graves (1956) reported favourable results with this policy, but in Manchester similar measures in use from January, 1957, to June, 1958, coincided with increasing rates of gonorrhoea in both sexes. The recent reports of diminished sensitivity of the gonococcus to penicillin contraindicates this use of long-acting preparations. Although penicillin may have played some part in reducing the present incidence of gonorrhoea as compared with that of the 1930s, by itself it makes no lasting impression (Ministry of Health Report, 1958). If penicillin resistance becomes general, any controlling effect resulting over the next few years from implementation of the Wolfenden recommendations on street prostitution may well be offset by increasing inadequacy of treatment. Consequent failure to cure, and relapses, recognized or undetected, will tend to maintain the reservoir of infection. It now seems clear that the initial hopes that penicillin would bring gonorrhoea under control were ill-founded and must be abandoned.

Future

Although the operation of the adverse ecological factors discussed above clearly places the control of gonorrhoea beyond the direct influence of the venereologist, we should lose no opportunity of making our contribution as effective as possible. The time seems ripe to view gonorrhoea more seriously, and this may best be conveyed to the patient by advising follow-up examinations more

than once during the first week after penicillin treatment. This policy would give additional opportunities for contact interview and for education of the patient as well as for observations regarding bacteriological cure. The follow-up of the defaulting patient by letter and/or visit may require overhaul; in the past decade confidence in penicillin and the rarity of syphilis has led in many clinics to relaxation of the former strict follow-up of gonorrhoea cases. The recent evidence of diminished sensitivity of the gonococcus suggests a return to the more positive measures of follow-up formerly employed. We have been impressed by the high default rate in the city as compared with that in the smaller peripheral clinics. The need for several doctors in large clinics means that a patient may see a different doctor on each of several visits. We believe that continuity of clinical care by the doctor seeing the patient at his first visit is an ideal to be pursued, and one likely to minimize default. Laird (1958) has recorded the concentration of sexual activity at the weekends and as the incubation period of gonorrhoea is from 2 to 4 days in the majority of cases, generous clinic services should be provided in the larger cities, especially from Monday to Wednesday inclusive.

It may be wise to view more and more of our patients as potential "repeaters". While we are often unable to discourage the male patient from re-exposing himself, we should stress his obligation to co-operate in bringing his source of infection and other contacts for examination. Watt (personal communication) has stated that the chronic repeater, somewhere between his eighth and seventeenth infection, regularly brings his infected consort for treatment. Anderson and Nelson (1954) also believe that "repeaters" frequently supply useful contact information. The "contact slip" and the services of social worker or health visitor should be fully used.

There are opportunities for strengthening the liaison between city and peripheral clinics in relation to sources of infection; thus any case of early acquired syphilis seen in the 22 clinics of the Manchester Regional Hospital Board area is notified to the venereologists of the area with epidemiological information about place of infection and subsequent contacts. A similar arrangement regarding gonorrhoea might be helpful.

The approaching end of compulsory military service will increase the potential of patients at civilian clinics and these young men will lack the education about V.D. which is given in the armed forces. This is a group which might well benefit from appropriate public education. At local level, notices in public lavatories giving the address and sessional times of the clinics should be well maintained and

their information kept up to date. An extension of these notices to those public houses, clubs, and dance halls known to be of epidemiological importance might be useful.

The recent trend for West Indian women to join their men-folk in Britain seems one to be encouraged, as a factor likely to promote stability in their sexual relationships. The problem of itinerant labour is more difficult to solve. It seems likely to continue in the United Kingdom and may well increase in Western Europe as a result of the migration of labour which may follow economic union between countries.

Any of the measures mentioned above can singly achieve little, but in concert would be useful. It is clear, however, that even the conscientious application of all the control measures hitherto available will not eradicate gonorrhoea. The "balance sheet" (Table VIII) shows as many unfavourable as favourable factors, and there is nothing in sight to counteract the effects of the "reservoir" of infection in largely asymptomatic, promiscuous women, prostitutes or otherwise, and the presence of many men from abroad who for various reasons fail to achieve stability in their sexual life. We conclude from our survey, therefore, that existing measures and conditions are such that the control of gonorrhoea is not possible.

TABLE VIII

'BALANCE SHEET' OF FACTORS IN THE CONTROL OF GONORRHOEA

Favourable	Unfavourable
Effective treatment of individual cases	Diminished sensitivity of the gonococcus to penicillin
Contact tracing	Asymptomatic female carriers
Improved socio-economic conditions	Immigrants unlikely to become socially integrated
Implementation of Street Offences Bill, which may reduce street prostitution	Prostitution likely to expand elsewhere, e.g. in public houses, clubs, dance-halls, etc.

Gurney Clark (1954) listed the available methods of controlling any infection as follows:

- (a) Health promotion;
- (b) Specific protection;
- (c) Early reporting and prompt treatment;
- (d) Disability limitation;
- (e) Re-habilitation.

All but item (b) are already used in gonorrhoea control, and specific protection against gonorrhoea

has been suggested (Morton, 1958) if research could make effective immunization available. Lines of investigation include the detection of antibodies by fluorescent techniques, the study of tissue immunity to the gonococcus in animals, and the problem of overcoming such immunity so that animals could be infected and studied, and analysis of the chemical composition of the gonococcus. Tauber and Garson (1957) have prepared and studied the properties of a gonococcal endotoxin from mass cultures. It is apparent clinically that one or many attacks of gonorrhoea do not produce effective immunity to re-infection, perhaps because it is usually a localized infection, and before a successful vaccine can be produced much fundamental research will be required. Little is known about the gonococcus and its antigenic properties and, in spite of bacteriological and immunological advances in many other directions, the gonococcus remains a much neglected organism.

If effective vaccination against gonorrhoea becomes possible, certain biological and ethical problems would arise. The risk of producing asymptomatic carriers of gonorrhoea by immunization must be explored, but this has not proved a serious objection in immunization against diphtheria (Medical Research Council, 1945; Bender, 1937) or typhoid (Lewes, 1948). Immunization should, of course, be reserved for selected groups: prostitutes and "repeaters" in civilian life, and perhaps military personnel in time of war. In this way the "reservoir" of gonococcal infection and its replenishment might be reduced.

A recent annotation (*Lancet*, 1958) questioned the ethics of active immunization against gonorrhoea should this become possible, meaning presumably, that the removal of fear of infection would lead to increasing promiscuity. It seems doubtful that this view is valid. The small part played by fear of infection has been offset for almost a decade by the promise of prompt cure, and it is our belief that such fear plays an increasingly small part in sexual continence. In the civilian groups which we propose for immunization, namely prostitutes and promiscuous men, this fear is not apparent in their sexual behaviour, and immunization would be restricted to those who had already been infected and treated. Moreover, immunization against gonorrhoea, which is the major problem of V.D. control in Great Britain, would provide no protection against other venereal conditions. For all these reasons the objection, based on fear of venereal infection, does not seem tenable and should not discourage the basic research on the gonococcus which will be required if eventual control of gonorrhoea is to be achieved.

Summary and Conclusions

The ecology of gonorrhoea and the methods used for its control are discussed. It is normally an infection of the promiscuous and is most frequent in the large cities, where immigrants and itinerants congregate and fail to establish stable sexual relationships. The socio-economic factors are complex, but the influence of prostitution and alcohol is clear. The asymptomatic nature of the infection in the female and the persistence of a "reservoir" of gonorrhoea in a small but promiscuous section of the female population are the major causes of the failure of our attempts at control.

This failure, the rising incidence of gonorrhoea, and the threat of penicillin resistance call urgently for research with a biological approach which might, by making possible the immunization of carefully selected groups, eventually lead to the eradication of gonorrhoea.

We are indebted to Dr. R. A. Leader, Medical Officer of Health, for the data about the Ipswich Clinic.

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CORRESPONDENCE

TO THE EDITOR OF THE *British Journal of Venereal Diseases*.

Dear Sir.—I should like to call your attention to what I feel is a mis-statement of fact in the article by Bailey and Bishop in the *British Journal of Venereal Diseases* (1959), 35, 8. The statement is as follows: "... a Donovan body, found characteristically in the cytoplasm of white blood cells, particularly the large mono-nuclear leucocytes."

To my knowledge the Donovan body of granuloma inguinale has never been demonstrated in any circulating white blood cells. The organisms parasitize large mononuclear tissue (endothelial) cells and may be demonstrated by tissue spread preparations or histologic section. Pund and Green-

blatt feel that the parasitized tissue cell found in histologic sections is as pathognomonic for granuloma inguinale as the Sternberg-Reid cell is for Hodgkin's disease.

It is hoped that this note may in some measure serve to rectify and clarify a possible misconception concerning the Donovan body of granuloma inguinale.

Yours faithfully,

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