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THE INCIDENCE AND CAUSES OF BLINDNESS IN THE BRITISH COMMONWEALTH

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Only a tentative estimate of the number of blind and the barest of assessments of the causes of blindness in the British Commonwealth as a whole are possible. Fairly complete data are available for England, Wales, and Scotland, but those for other parts of the Empire vary between being relatively adequate to negligible. Any final analysis is therefore out of the question.

1. THE NUMBER OF BLIND

The two fundamental difficulties in assessing the number of blind are the lack of a universally accepted definition of blindness and the lack of uniformity in the methods employed for collecting blind statistics.

In the census returns of most countries information is sought on physical and mental infirmities in the population. Those totally blind are asked to declare this fact. The census returns therefore deal with total blindness as determined by a lay assessment. A lay assessment also enters largely into the statistics supplied by voluntary agencies caring for the blind, though total blindness is not generally the only criterion used by such agencies in granting benefits. Statistics from such sources are far from comprehensive, as they deal with only that section of the blind population which seeks charitable relief, and their extent is, moreover, determined by the energy and resources of the agency in question; furthermore, lay assessment is still the general rule and appears to be particularly capricious when total blindness is no longer the criterion.

In contrast to these two distinctly fallible methods is the one that has emerged only recently as a result of the administration of the Blind Persons Act of 1920. Under this Act statutory benefits were made available to the blind in England, Wales, and Scotland, admission to the Register being obtained on medical certification—which of late has generally meant certification by an ophthalmologist. The data thus obtained have therefore considerable uniformity, but still cover only those who seek the statutory benefits that the Act allows. The fundamental difficulty as to what constitutes blindness is masked rather than solved by the statutory definition of "so blind as to be unable to perform any work for which eyesight is essential." In practice this has been interpreted—somewhat arbitrarily—to mean vision of 3/60 or less with a full field, or better central vision when associated with specified field defects.

For England, Wales, and Scotland data on medical certification by a definite, even if controversial, standard are thus available, and these data are limited only by the fact that not all blind persons seek certification. Elsewhere census returns are still the main source of information, but for some years now there has been considerable criticism of such returns. The data thus obtained have come to be regarded as so unreliable as not to be worth the trouble of collecting, and inquiries for personal infirmities have been discontinued in the censuses for 1921 and 1931 in Great Britain and in that for 1940 in the U.S.A. None the less census data are the fullest that are available for the greater part of the Commonwealth, and critically interpreted they are of considerable value, as will be shown in what follows.

British Isles

England and Wales.—In 1911, when the last census which sought information on infirmities was taken, there were 26,336 persons who declared themselves totally blind. When the Register under the Blind Persons Act was established there were found to be 25,840 eligible—a close approximation to the census figures. The number of registered blind has, however, increased steadily year by year, as the following figures show:

Year	Number on Blind Register	Year	Number on Blind Register
1920	30,785	1933	63,408
1921	34,894	1936	67,534
1923	36,518	1938	71,875
1925	42,140	1940	74,418
1927	46,822	1942	75,306
1929	52,727	1943	76,507
1931	60,598	1944	76,145

There is, of course, no reason for believing that the incidence of blindness has increased during 1920–44 in the startling proportions suggested by these figures; these merely represent an increasing efficiency in the registration of the blind. They furthermore indicate that registration has become fairly effective during recent years. It is also clear that the census figures were a gross underestimate, but it must be borne in mind that the criteria of blindness adopted for these two different returns were different; for the census it was total blindness, for the purpose of the Blind Persons Act it was—in practice—3/60. That the census returns were not quite meaningless is shown by the following findings: An analysis of 9,522 blind certificates in the Counties of London and Middlesex (Sorsby, 1945a) showed that 1,013 were totally blind and 1,822 had perception of light only. The rest mostly had vision up to 3/60. Thus some 2,835 qualified for what a layman would regard as total blindness, making 29.9% of all registered blind in these areas. If it is taken that 30% of all the registered blind in the country are blind in the lay sense indicated (i.e., no perception of light and perception of light only), an incidence of blindness approximating that shown by the census figures of 1911 is obtained. It is impossible to assess the number of blind persons who have not sought registration. At hospitals one still sees certifiably blind patients who have not been registered, while an unknown proportion for various reasons decline certification. It is safe to conclude that the number of blind people in England and Wales is not less than 80,000 and is unlikely to exceed 100,000.

Scotland.—The census for 1911 showed 3,317 blind persons in a population of 4,760,904 (or 70 per 100,000). The number of registered blind persons was 4,104 in 1919—a close approximation, as in England and Wales, to the census figure. But again as in England and Wales it has risen steadily, the rise being confined to the years up to 1929.

Year	Number on Blind Register	Year	Number on Blind Register
1919	4,104	1933	8,678
1921	5,138	1936	8,500
1923	5,754	1938	8,973
1925	6,332	1940	8,908
1927	6,939	1942	8,891
1929	8,518	1944	8,804
1931	8,821		

The Dominions

Canada.—The census figures for 1931 showed 7,343 blind persons in a total population of 10,376,786 (or 71 per 100,000). Statutory benefits for the blind were introduced by Act of Parliament in 1937, and by July, 1938, there were over 3,000 applicants for blind pensions. This was distinctly less than the 4,712 blind on the registers of the Canadian National Institute for the Blind in 1927, but the number of registered blind (? under the Act of 1937) had risen to 12,854 by 1944. It would therefore seem that in Canada the experience of England and Wales is being repeated, and that the number of registered blind is likely to increase. In Newfoundland the number of registered blind in 1944 was 219. The 1911 census showed 287 blind in a population of 242,619 (118 per 100,000).

South Africa.—In an official inquiry carried out in 1936 concurrently with the census there were 1,624 blind amongst the white population of 2,003,857, or 81 per 100,000. No adequate data are available for the coloured population: the same inquiry covering 769,661 coloured persons, excluding Bantu and Asiatics, showed 981 blind (127.7 per 100,000). At the end of December, 1940, the South African National Council for the Blind had detailed information regarding 17,263 blind persons in the Union; there were 1,828 Europeans, 1,632 coloured, and 13,803 natives. Since then, and especially since 1942, when the payment of an increased grant to blind natives was introduced, the Council has been "inundated with registrations of blind natives and the total had increased by leaps and bounds." Recently the Act allowing grants to blind people has been amended to include Indians. There is as yet no information as to the number of blind Indians in the country. By December, 1943, the total number of registered blind had risen to 30,834, and consisted of 2,103 Europeans, 1,887 coloured, and 26,844 natives. On the basis of an estimate of the population supplied by the Director of Censuses the rate per 100,000 at the end of 1942 for the three different communities was: European 91, coloured 211, natives 351.

Australia.—The 1933 census for the Australian Commonwealth showed 3,898 blind in a population of 6,229,839 (63 per 100,000).

New Zealand.—The census for 1916 showed 570 blind in a population of 1,009,449. The New Zealand Institute for the Blind in 1936 estimated the number of blind at 1,000 for the whole country, or 70 per 100,000 (against 56 shown by the census of 1916). It had records of 720 blind, and of these 688 were totally blind. (It is unlikely that with 688 known cases of "total blindness" the total number of blind, by English standards, would be only 1,000.)

The total white population of Canada, Newfoundland, South Africa, and Australasia is of the order of 20 millions. The census rates of blindness per 100,000 were 71 for Canada (1931), 118 for Newfoundland (1911), 81 for South Africa (white population, 1936), 63 for the Australian Commonwealth (1933), and 56 for New Zealand (1916). These are not dissimilar from the census rate of 73 for England and Wales and 70 for Scotland in 1911. If it is concluded, on the strength of experience in England and Wales since the working of the Blind Persons Act, that the actual rate is about 200–250 per 100,000 (on the basis of a computed number of 80–100,000 blind in a total population of 40,000,000), the total of blind amongst the white population of the Dominions is of the order of 40–50,000.

Other Possessions

India.—The census for 1931 showed 606,360 blind in a population of 352,837,778—a rate of 172 per 100,000. It is generally agreed that this is a considerable underestimate. If the rate of blindness known for England and Wales applied to India, its population of over 400,000,000 would provide 800,000 to 1,000,000 blind. But blindness in India is far more common than in England and Wales, and it appears that Indian census figures on blindness are grossly vitiated by the widespread illiteracy and by superstitious fears. On studies undertaken in selected areas both Henderson and Kirwan hold that the census figures indicate only one-third of the blind in India; Megaw puts it as low as one-quarter. Moreover, even these observers, in speaking of blindness, use a considerably lower

criterion than that now used in England—i.e., counting fingers at one metre instead of 3/60. At the very least the census figure of 606,360 must therefore be multiplied by three or four. This gives the number of those totally or subtotally blind as between 2 and 2½ millions. For the present this must be accepted as a minimum figure. The actual number is likely to be considerably more, for India is one of the classical countries of blindness, and according to O'Dwyer "there is no country in the world to-day where the affliction of blindness is so widespread." This being so, a comparison with Egyptian and Palestinian figures rather than with those for England and Wales is called for. In both Egypt and Palestine the census figures indicate a rate of blindness 10 to 15 times that for England and Wales. On that basis the blind in India number between 10 and 15 millions.

Ceylon.—The census for 1921 showed 4,005 blind in a population of 4,498,605—a rate of 89 per 100,000. There is no reason for believing that the situation in Ceylon is substantially different from that of India, and the census figure must be regarded as a serious underestimate.

Egypt.—The appalling rate of 1,325 blind per 100,000 was recorded by the census of 1907. Ten years later it had declined to 1,222, whilst in 1927 it fell to 775 (109,934 blind in a population of 14,177,864).

Palestine.—Palestine has the world's highest census rate for blindness. It was 843 per 100,000 in the 1931 census (8,172 blind in a population of 969,268), surpassing the rate of 775 recorded for Egypt in 1927. In contrast to the high rate for the Muslims of the country, that for the Jews is relatively low, and for Christian Arabs intermediate between the two (Muslims 1,061, Christians 564, Jews 139 per 100,000).

African Colonies.—No adequate data are available for the greater part of Africa. The native population in Uganda in 1911 showed a census rate of blindness of nearly five times that of England and Wales (354 against 73 per 100,000). It is not known whether blindness in the native population in Africa is of the order of frequency seen in India, Egypt, and Palestine. That blindness is extremely frequent, and indeed far more frequent than anywhere else in the world, is suggested by the following findings concerning natives in the Union of South Africa: Rosset-Berdez (1944) in an inquiry for the South African Government examined 4,500 natives; only 527 (13.2%) were normal; 214 (5.3%) were totally blind; 360 (9.0%) had lost one eye as a result of disease.

Pacific Islands.—Information is scanty. The census for 1911 for the Fiji Islands showed 1,385 blind in a population of 137,248, giving a rate of 1,009 per 100,000—i.e., a rate of the order of Egypt and Palestine. It is not known whether the Fiji Islands can be regarded as typical of Indonesia.

It is obvious that, whatever be the definition of blindness, no final assessment of the number of blind in the British Commonwealth is possible. A fairly clear indication is available for the 46,000,000 in England, Wales, Scotland, and Northern Ireland: it cannot be less than 90,000 and is likely to exceed 100,000. For the 20,000,000 whites in Canada, Newfoundland, Australasia, and South Africa the number of blind is likely to be 40–50,000. As for the native populations of the British possessions in Africa, Asia, and Indonesia, their blind would number about 1½ million if blindness were no more common among them than it is in the British Isles and the Dominions, but it is likely that the actual figure is considerably more than 10 millions.

2. THE CAUSES OF BLINDNESS

Data on the causes of blindness in England and Wales and in Scotland are fairly adequate. Elsewhere the information is scanty.

England and Wales.—No less than 77.2% of the 76,507 registered blind in 1943 were over 50 years of age; 20.8% fell in the age group 16–50 years, and 2.0% in that of 0–16 years. Analyses of the data as to the age at onset of blindness do not affect substantially the outstanding fact that in most cases blindness is an affliction that, in the phrase of the *Iliad*, sits on the sad threshold of old age. As to the causes of blindness, the Prevention of Blindness Committee (1938) gives an analysis of 5,290 blind certificates and the Northern Counties Association for the Blind (1938) of 10,000 certificates. Both agree in

placing cataract first with 25.0% and 33.6% of the total respectively; in both series glaucoma takes the second place with 11.8% and 10.0% respectively. Defects of congenital, hereditary, and developmental origin, and myopia take the third and fourth places in the first series (with 11.0% and 10.2% respectively), and occupy the reverse order in the second (with 7.0% and 8.5% respectively). Taken together, these four causes—cataract, glaucoma, defects of congenital, hereditary, and developmental origin, and myopia—account for 58.0% in the analysis of the Prevention of Blindness Committee and 59.1% in that carried out by the Northern Counties Association for the Blind. Substantially the same result was obtained in an analysis of 9,562 registered blind in the Counties of London and Middlesex (Sorsby, 1945a). Cataract and glaucoma again took the first and second places with 21.2% and 14.0% respectively, whilst myopia accounted for 12.1% and defects of congenital, hereditary, and developmental origin for 10.4%, the total for the four main causes being 57.7%. When this series of 9,562 cases is analysed in age groups a considerably different picture emerges.

(1) In the age group 0-14 years (143 cases) defects of congenital, hereditary, and developmental origin lead with 67.1%, and ophthalmia neonatorum is second with 5.6%, the remaining causes all being considerably less significant.

(2) In the age group 15-29 years (656 cases) defects of congenital, hereditary, and developmental origin still lead with 38.4%, with congenital syphilis in the second place with 14.0%.

(3) In the age group 30-49 years (1,303 cases) the leading cause is still as in the other two age groups, this time with 21.3%, and with myopia in the second place with 15.5%. Congenital syphilis is now third with 13.1%.

(4) In the age group 50-69 years (3,541 cases) myopia leads with 18.6%; glaucoma and cataract come second and third with 15.2% and 14.0% respectively.

(5) In the age group of 70 years and over (3,725 cases) cataract is responsible for 39.3% and glaucoma for 19.3%, with senile macular lesions in the third place with 11.7%.

The numerical frequency of cataract and glaucoma, which is so striking a feature in the statistics for the blind population, gives an exaggerated significance to these two causes. When the causes operative in the different age groups are evaluated in terms of years of expectation of life—i.e., in expected years of blindness—cataract falls from the first place to the third with 13.1% of the total of expected years of blindness, and glaucoma falls from the second to the fourth place with 10.0%. Defects of congenital, hereditary, and developmental origin, which in order of frequency are fourth, now assume a preponderant first place with 22.9%, and myopia takes the second place with 16.0%. The congenital and congenitally determined anomalies (such as myopia) together are thus responsible for no less than 38.9% of the total of expected years of blindness, whilst cataract and glaucoma together, though numerically so outstanding, account for considerably less—viz., 23.1%. On this reckoning congenital syphilis is also a cause of some importance, accounting for 8.8%, with ophthalmia neonatorum not far behind (6.2%). If these provisional data on the blind in London and Middlesex apply to England and Wales as a whole, the major causes of blindness are not cataract and glaucoma but, in order of frequency, defects of congenital, hereditary, and developmental origin, myopia, cataract, glaucoma, congenital syphilis, and ophthalmia neonatorum.

Scotland.—As in England and Wales most of the blind are over 50 years of age (the actual percentage for 1943 being 74.1 against 77.2 in England and Wales). Marshall and Seiler's study of 2,885 registered blind in Glasgow and South-West Scotland places myopia as the first of causes with 15.9%; cataract, chronic septicaemia, glaucoma, and congenital anomalies follow with 15.2%, 10.9%, 8.9%, and 8.1% respectively. Ophthalmia neonatorum occupies the eighth place with 3.4%. Calculated in years of blindness the patients in these different categories had experienced, chronic septicaemia comes first (with an average of 12 years); congenital, hereditary, and developmental anomalies second (11.4 years); myopia third (10.3 years); and ophthalmia neonatorum fourth (10.1 years). Cataract and glaucoma come low with the eighth and tenth place respectively. These findings agree with those for London and Middlesex on the significance of defects of congenital, hereditary, and developmental origin, and of myopia as foremost causes of blindness.

The Dominions.—No adequate data are available. There are various analyses of returns from blind schools and institutions and from records of patients seen by ophthalmologists in practice. They give the impression that in Australia, New Zealand, and Canada, at any rate, the same causes of blindness operate as in the British Isles. Registers of blind persons, comparable in completeness as to numbers and causes, do not appear to be available for any of the Dominions, except possibly South Africa. Here a register in the process of formation provides data on the causes of blindness in 26,844 natives and 2,103 whites registered by December, 1943. The main causes recorded were:

	White (2,103 Cases)	Native (26,844 Cases)
	%	%
Cataract (senile, traumatic, and unspecified) ..	9.7	42.6
Syphilis	11.2	5.8
Glaucoma	7.2	2.4
Trachoma	5.0	2.0
Local infections of coats of eye	4.5	8.9
Ophthalmia neonatorum	4.4	0.8
Congenital, hereditary, and developmental defects (including congenital cataract)	20.9	1.2

Without a fuller knowledge of local conditions and the way these data were collected, the interpretation of these findings is difficult. A significant observation is the finding of trachoma in 135 natives out of 10,591 examined in a special investigation (Rosset-Berdez).

India.—Several analyses of the causes of blindness in relatively small series are available. In a series of 2,750 reported by Megaw cataract was responsible for 23%, glaucoma and smallpox for 9.0% each, and trachoma for 8.0%. In a series of 2,044 blind eyes Gnanadikam found that among those blind in both eyes the order of frequency of the causes was glaucoma, corneal ulcer, keratomalacia, trachoma, iritis, smallpox, and gonorrhoeal ophthalmia. Another observer (Bagchi) gives the following order of frequency in 3,404 persons blind in one or both eyes: anterior staphyloma, 39.7%; trauma, 7.0%; trachoma, 6.2%; leucoma, 5.9%; keratomalacia, 5.5%. In 74 inmates of the Calcutta Blind School Indra found the following distribution: congenital, 15 cases; smallpox, 11; syphilis, 10; ophthalmia neonatorum, 5; keratomalacia, 4—the last being regarded as an underestimate of the frequency of the affection, "as few such children can afford the expenses of the Blind School." Wright (1937) gives the principal causes in order of importance as:

In Children	In Adults
Keratomalacia	Cataract
Ophthalmia neonatorum	Optic atrophy (mainly syphilitic)
Congenital syphilis	Corneal ulcers
Hereditary blinding disease	Glaucoma
	Trachoma

while in both children and adults irritant remedies (the result of ignorance and the lack of adequate facilities for treatment) and smallpox are potent factors. All these assessments have one thing in common: the immense amount of blindness caused by various uncontrolled infective processes and by malnutrition.

Egypt.—In a cumulative list of causes of blindness published in the reports of the ophthalmic hospitals the predominant cause of blindness in some 75,000 cases [? eyes] are shown as conjunctivitis with corneal complications and its sequelae. Some 82% of all blind fell into this category, and it appears that acute ophthalmia rather than trachoma is the main form of conjunctivitis leading to blindness. Glaucoma is also a cause of some significance.

Palestine.—The reports of the Ophthalmic Hospital of the Order of St. John, Jerusalem, give a parallel analysis to that in the Egyptian reports and the findings are similar. Some 78% of all blindness is caused by conjunctivitis and its corneal complications. Shihab (1937) holds that some 75% of all blindness is caused by the acute ophthalmias, and that the two extremes of age are most susceptible.

Trinidad and Tobago.—In a study of the causes of blindness in 194 patients Métévier found syphilis the cause in 45 instances, glaucoma in 38, and leprosy in 14. Other significant factors were cataract and purulent ophthalmia.

African Colonies.—Little is known of the causes of blindness in the African colonies. Trachoma is probably rare but not unknown, as was previously believed. Two recent studies have drawn attention to onchocerciasis (Ridley, 1945; Scott, 1945). It is not known whether the incidence and causes of blindness seen in the natives of the Union of South Africa are typical of the African population as a whole.

3. PREVENTION OF BLINDNESS

In England smallpox figured as the main cause of blindness in such assessments as are available for the early years of the last century. Towards the end of the century ophthalmia neonatorum was the largest single cause; in a collective survey carried out by the Ophthalmological Society in 1884 it was found responsible for between 30 and 40% of blindness seen at blind schools and institutions. These findings may be taken as indicative of the role of infectious diseases as causes of blindness in this country during the last century. To-day infectious disease—both exogenous and endogenous—accounts for only a small proportion of all blindness; in the survey for the Counties of London and Middlesex it stood at not much more than 15% (Sorsby, 1945a). Generally speaking, the most significant cause in the undoubted decline in the incidence of blindness in England, and in advanced countries generally, has been the control of infectious disease by public health measures, adequate facilities for treatment, and of late years the advances in chemotherapy, beginning with arsenic-amides in the treatment of syphilis. Other causes in the decline of blindness have been the development of ophthalmology, the rise of eye hospitals and eye departments, and the perfection of operative techniques for cataract and glaucoma.

England and Wales.—The decline in the incidence of blindness in England and Wales is hardly reflected by the mounting number of registered blind since 1920. That a decline has taken place is suggested by the census findings since 1851, which have shown a steady diminution in the rate of incidence per 100,000 with each census. The rate in 1851 was 102; it declined to 96, 95, 88, 81, 78 at the subsequent decennial censuses, falling to 73 in 1911. More definite evidence is supplied by the returns for the age group 5–16 years under the Blind Persons Act of 1920. Unlike those for the other age groups, the returns for this group may be taken as giving a true presentation, for children come under the care of the school authorities, and the blind child is unlikely to escape registration. In contrast to the increase in the total number of registered blind, there has been a striking decline in the number of registered blind children, as the following table shows (Sorsby, 1945b).

TABLE I.—Incidence of Blindness in Children aged 5–16 Years, England and Wales, 1823–43

Year	Population aged 5–16 Years	No. of Registered Blind aged 5–16 Years	Rate per 100,000
1923	7,477,143	2,723	36.4
1925	7,306,761	2,720	37.2
1927	7,385,359	2,554	34.6
1929	7,262,590	2,438	33.6
1931	7,166,056	2,355	32.9
1933	7,246,446	2,089	28.8
1936	6,890,730	1,853	26.9
1938	6,694,300	1,676	25.0
1939	*	1,619	24.2†
1940	*	1,499	22.4†
1941	*	1,425	21.3†
1942	*	1,369	20.5†
1943	*	1,355	20.3†

* Population figures not available for publication. † On 1938 population figures

A decline to almost a half in the space of twenty-one years is a gratifying testimony to the efficacy of the many measures that are operative in the prevention of blindness. But it cannot be assumed that this trend is applicable to the whole blind population. In fact it is likely to be almost entirely confined to the lower age groups. It has already been seen that the causes of blindness are notably different in the different age groups and that nearly 80% of the blind are over 50 years of age. There is no reason for believing that blindness from cataract, glaucoma, myopia, and senile macular lesions—the causes operative in that age group—is declining to any marked extent, while the evidence available for the causes of the decline in the incidence of blindness in the young indicates that the reduction in them is wholly due to the elimination of the

sequelae of infectious disease. This is brought out by the following comparative table of the causes of blindness seen at provincial blind schools in 927 children in 1922, and 524 in 1944 (Sorsby, 1945b).

TABLE II.—Proportionate Incidence of the Main Causes of Blindness at Provincial Blind Schools in 1922 and 1944

	Board of Education, 1922 (927 Cases)	Present Series, 1944 (524 Cases)
	%	%
Ophthalmia neonatorum	30.4	9.2
Purulent ophthalmia of later years	2.5	—
Phlyctenular ophthalmia	3.7	0.2
Interstitial keratitis	4.1	0.9
Iridocyclitis	2.5	0.8
Choroiditis	?	0.8
Syphilitic lesions	?	2.5
Optic atrophy	12.9	5.3
Congenital anomalies:		
Including myopia	37.2	67.6
Excluding myopia	30.8	55.0

This table shows a striking reduction in blindness from ophthalmia neonatorum and suggests a corresponding decline in blindness from congenital syphilis. As a corollary, blindness due to defects of congenital, hereditary, and developmental origin (in which myopia may be included) has assumed a proportionately increased significance. Two conclusions suggest themselves:

(1) The decline in the incidence of blindness in children is likely to come to an end within foreseeable time, in view of the fact that already some 65% of all blindness in children is due to defects of congenital or congenitally determined origin, and such defects are not readily amenable to treatment. It is therefore likely that blindness in children 5–16 years old will decline from its present rate about 20 per 100,000 to about 12–14 per 100,000, but will remain at that level until more is known of congenital and congenitally determined disease.

(2) No substantial decline of the blind population as a whole is to be expected so long as there is no fuller knowledge of cataract, glaucoma, myopia, and the senile degenerations of the fundus oculi. Such decline as may be expected from better facilities for treatment may well be balanced by the shift towards more people in the higher age groups of the population as a whole.

A century of effort in public health legislation, hospital administration, bacteriology, and pharmacology is reflected in the diminution of the incidence of blindness. The further operation of these forces is likely to reduce blindness still more, but at an ever-diminishing rate. Substantial advances can only come with intensive studies of the nature of genetic disease and intra-uterine infections on the one hand, and of cataract, glaucoma, and senile degenerations on the other. These are not all exclusively ophthalmic problems, any more than was blindness from infectious processes. In ophthalmology, however, these problems in pathology have become formulated perhaps more clearly than in other specialties.

Scotland.—In Marshall and Seiler's study of 3,219 blind persons 113 were aged 0–15 years, and of these 37 were blind from defects of congenital, hereditary, and developmental origin, and 3 from myopia. This is a considerably lower incidence than that noted for the provincial blind schools of England. Proportionately there was more blindness from infectious disease. For the higher age groups their findings are essentially parallel with those for London and Middlesex.

The Dominions.—In the absence of more definite data it may be assumed that the problems of the prevention of blindness in the white population are similar to those established for the British Isles.

Africa.—The limited inquiry of Rosset-Berdez for South African natives suggests that one in every twenty Africans is blind. If this is true and applies to Africa as a whole, it is unbelievable that such a state of affairs is not largely remediable. Fuller information is an urgent first step.

India.—Such Indian blind statistics as are available give prominence to lesions like anterior staphyloma (39.7% in one series), leucoma, and corneal ulcer. Trachoma is known to be endemic in some parts of the country; smallpox is still a significant cause of blindness, while ophthalmia neonatorum and congenital syphilis are recognized as important causes of blindness in children. All this is reminiscent of England at the

beginning of the last century. The control of blindness in India is thus largely a problem of the control of infectious disease. That this is not purely an issue of pathology and pharmacology is obvious enough from the history of public health in Western Europe, and is grimly emphasized by the fact that keratomalacia—a nutritional deficiency disturbance—is ranked as first among the causes of blindness in children. The problem of blindness in India is not one of the elimination of a particular infectious disease such as trachoma or the acute ophthalmias. It has to be conceived in terms of standards of living, education, facilities for treatment, and adequate and well-trained ophthalmic personnel. None the less there is much that can be done immediately both outside and as part of the long-term plans—how much, can be seen more clearly from a consideration of the position in

Egypt and Palestine.—Here the social problems are not dissimilar in their broad aspects from those seen in India, but unlike in India two clearly defined infectious diseases are the main causes of blindness—the acute purulent ophthalmias and trachoma. Purulent ophthalmia, the more significant cause, is now easily treated by the sulphonamides and by penicillin. An immediate and striking reduction of blindness in Egypt, Palestine (and, indeed, throughout the whole of the Near and Middle East), and perhaps India, could be brought about by the organization of relatively simple treatment stations and possibly mobile units, with adequate supplies of the new chemotherapeutic and antibiotic agents. Trachoma, too, could be considerably reduced by such stations, for the beneficial effect of sulphonamide therapy in trachoma is no longer open to doubt; moreover, there are indications that penicillin may also be highly effective. The creation of such treatment stations will in any case have to be undertaken in any long-term programme, but a sense of urgency has now been supplied by the availability of the new therapeutic agents, for each day that such treatment is not available to the millions of Africa and Asia adds many blind to the roll of the avoidably blinded.

Summary

1. The number of blind in the British Isles is not less than 90,000 and is likely to exceed 100,000. In the white population of the Dominions it is between 40,000 and 50,000. In the native population of the British possessions in Africa, Asia, and Indonesia it is considerably more than 10 millions.

2. There has been a marked decline in the incidence of blindness in childhood in England and Wales during the past 21 years, but there is no evidence that there has been any substantial decrease in the older age groups. Before long the decline in the incidence of blindness in childhood will come to an end, as already about 65% of all blindness in children is due to congenital and genetic infections not readily amenable to treatment. With the rapid elimination of blindness due to infectious disease, intensive research in the problems of genetic disease, maternally transmitted infections, cataract, glaucoma, and the pathology of senescence, has become an immediate task if the incidence of blindness in England and Wales is to be reduced.

3. In the native populations of the British possessions the incidence of blindness could be reduced immediately and effectively by the organization of facilities for the intensive exploitation of the sulphonamides and penicillin in the treatment of the widely prevalent ocular infections.

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OBSERVATIONS ON OEDEMA OCCURRING DURING THE COURSE OF MACROCYTIC ANAEMIA

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"Tropical" or "nutritional" macrocytic anaemia is described in the textbooks, and Wells in India, Trowell in Africa, and a number of other workers have investigated it. Unfortunately, Service conditions render this literature inaccessible, and in this account of certain features of the disease which seem of practical importance I may be treading on ground that has already been covered. Reference to previous work is omitted from necessity, not from negligence.

The textbooks describe the disease as an anaemia, often severe, of a macrocytic type, occurring in India, Africa, the Balkans, and southern United States, among populations suffering from poor nutrition. It is often seen in pregnant women. It is accompanied by fever, diarrhoea, sore tongue, and sometimes oedema (which seems to have been referred to cardiac decompensation). Achlorhydria is said not to occur. Haemolytic and non-haemolytic types of the condition are distinguished.

Discussion with fellow officers suggests that many cases of this kind occur in South-East Asia Command; most commonly among Indian troops, less so among East Africans, occasionally among West Africans, and hardly ever among British soldiers. It is proposed to discuss a series of 38 cases among East Africans, laying stress on certain features.

Table I shows the frequency with which the signs and symptoms mentioned above were observed in this series. Anaemia of a more or less severe degree was noted in all (several patients had blood counts of less than one million red cells when they came under observation). It is not proposed to comment especially on the cytology, which conformed to the textbook description. Macrocytosis was observed in all cases, and normoblasts were seen on a number of occasions. The absence of an adequate centrifuge precluded determinations of mean corpuscular haemoglobin concentration, or of other features requiring haematocrit readings. On several occasions the cells were reported to be macrocytic and hypochromic. Sternal puncture was done in several cases. It always revealed an actively normoblastic marrow. Sickling of the red cells was never observed, nor was increased fragility, even in cases which were clinically of a haemolytic type. No neurological lesions of any kind were noted.

TABLE I

Total cases	38
Glossitis	12
Gastric HCl after histamine:	
Absent	12
Present	16
Not determined	10
Jaundice	5
Splenomegaly	12
Diarrhoea	17
Oedema and/or ascites	12

While gross anaemia can be missed only through negligent examination, it will be obvious that the other signs and symptoms, except the oedema and ascites (which will be discussed more fully) and the achlorhydria, may be attributed to a number of complaints very common in South-East Asia Command. Haemoglobin determinations alone are insufficient to exclude a moderate anaemia of this type. The only safe procedure is to count the red cells as well as to estimate the haemoglobin. At the least, a well-prepared thin film should be examined by a reliable observer. In this hospital some cases were certainly missed before this point was appreciated.

Fever is usual in the more severe cases, and may be mistaken for that of malaria or other illnesses. Diarrhoea may be attributed to dysentery or to infestation with worms or flagellates. Several cases at first labelled "non-specific diarrhoea" proved later to be macrocytic anaemia. Splenomegaly may be attributed to malaria or schistosomiasis; and indeed, in the cases under consideration, it was difficult to be sure whether the enlarged spleens observed were in truth connected with the