

out that to deport him would be a great hardship to separate families, as all of the family are in this country. Deportation is unquestionably a hardship, and so is isolation in small-pox, but who would say that the latter should mingle with others because of the dread of the pest-house? One had better have small-pox than severe trachoma. At various times there have been discussions as to whether there should be some modification in the government's classification of this disease. Before any such change is determined on, however, it is well to consider that any such modification would mean the addition to our population of these thousands of trachomatous aliens whose emigration to this country is now prohibited.

It is a fact that trachoma is more easily preventable than curable, and is a splendid example of the old adage, "an ounce of prevention is worth a pound of cure." Our immigration law is the only guard we have against a disease that causes visual damage in 75 per cent. of untreated cases. Aside from the individual hardships and the ever-present handicap of the victims of this disease, there is an economic side that must be considered. The desperate conditions that may result from trachoma will impose financial burdens on the community and blindness may render its victims public charges. Every deportation probably entails some hardship, but deportations will occur as long as we have an immigration law. The sad cases are unfortunately not a few, but this is inevitable, and we should not allow this to work on our sympathy to such an extent that we are blinded to our duty to our own people. The fact that trachoma is already present is no argument in favor of importing more. The plea is often made by relatives and friends that these unfortunate people be sent to local hospitals for treatment at their own expense, and the law has provision for certain cases to be so treated. They are, however, usually not satisfied to remain there until a cure has been effected, and the doctor is continually importuned to release them. In fact, it is difficult to say when a disease is actually eradicated which is so prone to relapse as is trachoma. Although trachoma is very resistant to treatment, it is curable, and those aliens suffering from it should look to their treatment and cure before presenting themselves for admission to this country. There are plenty of immigrants seeking entry to our country who are free from disease, and there is no reason why we should accept those suffering from trachoma, a dangerous communicable disease. While trachoma is excluded as a "dangerous contagious disease" by the general government, there has so far been apparently little notice taken of it by the various states. Although many observers have sought for the cause of trachoma, its etiology is still in doubt, and we are unfortunately compelled to rely on clinical manifestations for diagnosis. Trachoma is a public health problem of the highest importance, and too much consideration cannot be given to its control.

TRACHOMA AMONG THE INDIANS

J. W. SCHERESCHEWSKY, M.D.
Surgeon, U. S. Public Health Service
WASHINGTON, D. C.

The destructive effects of trachoma on the eyesight and the difficulty and tediousness of effecting a cure are so well known that the apparent rarity of the disease in continental America has, until recently, been a cause for congratulation.

It is true that, prior to 1897, cases of trachoma in recently landed immigrants were common enough in the

eye clinics of our large cities. Since the time, however, when trachoma was classed by the federal authorities as a dangerous contagious disease, the exclusion of aliens so afflicted has been made mandatory by law and every arriving alien is examined to determine the presence or the absence of the disease in question.

As trachoma does not originate, *de novo*, in any uninfected territory, and its presence in any locality can be ascribed to previous importation, the action of the government in excluding persons afflicted with a communicable disease so likely to result in reduced social and economic efficiency has been a public-health measure of the first order. This measure has given our citizens the assurance that the members of those afflicted with this destructive disease will not, at present, receive many additions from other lands.

Recent investigations have shown, however, that there exist in the United States a number of important endemic foci of trachoma, among them the Indians, and it is the purpose of this paper to deal with the prevalence of this disease in that race. The facts herewith presented are based on the results of an investigation made last autumn by the Public Health Service as to the prevalence of tuberculosis, trachoma, small-pox and other infectious and contagious diseases among the various Indian tribes of the United States. The investigation was ordered by Congress and a report of the findings was rendered to that body Jan. 25, 1913, and published as Senate Document 1038.

The investigation was conducted under the immediate supervision of Assistant Surgeon-General J. W. Kerr, and I was one of the fourteen officers of the Public Health Service who took part in the inquiry.

As a result of the investigation, it may be stated at once that trachoma was found to be a veritable scourge among the Indians, as will be amply shown by the figures herewith presented.

It should be mentioned that the Indian Service had already called the attention of Congress and the medical world to the prevalence of this disease among Indians, and the investigation made by the Public Health Service was the direct outcome of such reports.

SCOPE OF THE INVESTIGATION

The Indian population of the United States is widely dispersed, individuals of this race being located in practically every state, and Indian reservations being situated in at least twenty-five states. According to official figures of the Indian Office, the Indian population in the continental United States is 322,715.

Of this number 39,231, or approximately one-eighth, were examined by the officers engaged in the investigation. Considerable difficulty was encountered in making these examinations because of the season in which the investigation was begun (fall of 1912), the short time available (a full report of the investigation had to be rendered to Congress before Feb. 1, 1913), the wide areas over which Indians are scattered on reservations and the inaccessibility of places where Indians are located. Long distances were traveled by the several investigators on foot, on horseback, by teams, motor-cars and motor-boats.

Besides the physical difficulties just mentioned, the natural diffidence or distrust of the Indians had to be overcome. Many Indians object to furnishing information about themselves and are loath to permit physical examination, either because they are ashamed of bodily defects or diseases or fear to subject themselves to malign influences.

RESULTS OF THE INVESTIGATION

Out of the 39,231 Indians examined, 8,940 individuals, or 22.7 per cent. of the entire number examined, were found to have trachoma. If this rate of infection were found to prevail for the entire Indian population of the United States, there are, at the present time, some 72,000 cases of this disease among this class of the population.

The persons examined represented both sexes and all ages, and included students in Indian boarding-schools, in day-schools and mission schools, and reservation Indians.

The accompanying table shows the number of Indians examined in each state, the number of cases of trachoma found, and the percentage of incidence.

TABLE SHOWING PREVALENCE OF TRACHOMA AMONG INDIANS IN DIFFERENT PARTS OF COUNTRY

State	Indians Examined No.	Cases of Trachoma	Per Cent.
Arizona	5,873	1,459	24.9
California	1,555	238	15.3
Colorado	202	41	15.04
Florida	22
Idaho	526	84	15.96
Iowa	53	17	32.04
Kansas	834	176	21.1
Michigan	643	48	7.46
Minnesota	3,542	533	15.05
Montana	2,042	537	26.3
Nebraska	322	130	41
Nevada	851	229	26.9
New Mexico	2,207	494	22.38
New York	943	2	0.2
North Carolina	317	23	7
North Dakota	3,447	791	22.94
Oklahoma	3,252	2,235	68.72
Oregon	904	94	10.4
Pennsylvania	552	70	12.76
South Dakota	6,121	1,059	17.24
Utah	182	75	39
Virginia	43	13	30.2
Washington	1,347	180	13.35
Wisconsin	2,990	207	6.86
Wyoming	392	199	51
	39,231	8,940	22.7

It will be seen from the table that, while the general rate of trachoma infection was found to be 22.7 per cent., the incidence of this disease varies greatly among Indians in different sections of the country; it varies, moreover (this the table does not show), even in different parts of the same reservation.

In Oklahoma the rate of infection found was excessively high. Among 3,252 Indians examined, 2,237, or 68.7 per cent., were found to be trachomatous. In New York, on the other hand, only two, or 0.2 per cent., of the 943 Indians examined had the disease, and it was found that these individuals had contracted the infection during their stay at an Indian boarding-school.

Other states which presented a high rate of prevalence among the Indian population, were: Wyoming, with 51 per cent.; Nebraska, with 41 per cent.; Utah, with 39 per cent.; Arizona, with 24 per cent., and New Mexico with 22.38 per cent.

PREVALENCE OF TRACHOMA IN INDIAN BOARDING-SCHOOLS

The prevalence of trachoma in Indian boarding-schools was naturally deemed of the highest importance in these investigations. The federal government looks on the boarding-school as its chief agency in raising the Indian's plane of civilization and in fitting him for citizenship. The conditions inseparable from institutional life are so favorable to the propagation of communicable disease that the question of the prevalence of trachoma in Indian boarding-schools was carefully gone into.

Data from 133 of these schools were collected and tabulated with the following results:

Out of 16,470 pupils in Indian boarding-schools, 4,916 cases of trachoma were found, a general percentage of 29.86. The highest percentage found was reported at the Rainey Mountain School in Oklahoma, where, out of 114 pupils examined, no less than 105, or 92.10 per cent. were found to be trachomatous, and the incidence of trachoma in the Indian boarding-schools of this state was found to be 69.13 per cent. Only three schools, of the entire number visited, one in Wisconsin and two in New York, were found to be free from trachoma. This is accounted for by the fact that no trachoma was found in the Indian population from which the inmates of these schools are drawn.

Classifying the schools according to the percentage of trachoma, it was found that in two schools over 90 per cent. of the pupils were trachomatous; in eight from 80 to 90 per cent.; in ten, from 70 to 80 per cent.; in nine, from 60 to 70 per cent.; in eight, from 50 to 60 per cent.; in eight, from 40 to 50 per cent.; in seven from 35 to 40 per cent.; in twelve, from 30 to 35 per cent.; in fourteen, from 25 to 30 per cent.; in ten, from 20 to 25 per cent.; in seventeen, from 15 to 20 per cent.; in eleven, from 10 to 15 per cent.; in ten, from 5 to 10 per cent.; and in four, from 0.5 to 5 per cent. In three schools only was no trachoma found. In eighty-eight schools, or 66 per cent., of the total number examined, 20 per cent., or more, of the pupils were found suffering from trachoma.

The percentage of trachoma incidence in boarding-school pupils, in general, 29.86 per cent., is considerably higher than that found for the total number examined (22.7 per cent.). The rate was also observed, in reservation boarding-schools, generally to be higher than in the reservations from which the pupils are drawn; while in the non-reservation boarding-schools, which are not located in reservations, but receive Indians from various parts of the country, it was found that groups of pupils from areas where trachoma is absent, or but slightly prevalent, showed a high rate of infection.

We are justified therefore in inferring that the Indian boarding-school has been an important factor in the dissemination of trachoma among the Indians.

PREVALENCE OF TRACHOMA IN INDIAN DAY-SCHOOLS

In addition to reservation and non-reservation boarding-schools, the government maintains Indian day-schools on the several reservations. The incidence of trachoma in day-school pupils was also investigated. The data collected were not so complete as those for boarding-schools because many of the camps were visited on days when the day-schools were not in session and others were located in inaccessible situations.

Nevertheless 3,488 day-pupils were examined and 752 cases of trachoma were found, a percentage of 21.55. The Indian day-pupils of Arizona were found to show the highest incidence, 41.3 per cent. of 990 Indian day-school children suffering from the disease. This is greatly in excess of the general rate (24.9 per cent.) found for the state.

On the other hand, in New York, out of 335 pupils examined, none had the disease. In no other state where Indians were examined were the day-school children free from trachoma.

If we exclude from the total just mentioned the relatively large proportion of New York day-schools pupils in whom no trachoma was present, the rate of prevalence, exclusive of this state, works out at 24 per cent.

This is in excess of the general average found for the total examination, but is considerably below the percentage found in boarding-schools.

The prevalence of trachoma in Indian day-schools seems to correspond fairly well with the general rate for reservations on which they are situated, and serves further to strengthen the inference that the higher rate of trachoma found in Indian boarding-schools is due to its spread among the inmates of those institutions.

PREVALENCE OF TRACHOMA AMONG RESERVATION INDIANS

Reservation Indians are considered to be Indians living on reservations and not examined in boarding-schools or day-schools. Their number included children below the school age and adults. During the course of the investigation 17,822 Indians of this class were examined with the result that 3,064, or 17.2 per cent., were found to be afflicted with trachoma. The majority of these individuals were examined either in the course of house-to-house inspection, or advantage was taken of gatherings at agencies and subagencies for the distribution of rations and the like.

The prevalence of trachoma in this group is seen to be distinctly below the rate found for the total number examined, the boarding-school rate and the day-school rate. On the other hand, by reason of the greater average age of the individuals and the consequent longer duration of the disease, most of the instances of visual damage were found among their number. The percentage of trachoma incidence noted for the various states varied from 60.46 per cent. in Oklahoma to 0 for New York and Florida. Other states with a high rate of prevalence were Utah, with 39.2 per cent.; Wyoming, with 37.26 per cent.; Nevada, with 36.5 per cent., and Montana with 30.76 per cent. It is worth noting that, in this state, the rate of prevalence among reservation Indians was found to exceed that in the boarding-schools and day-schools. States with a low rate of prevalence were Michigan, with 1.21 per cent.; Wisconsin, with 4.39 per cent., and North Carolina, with 5.45 per cent.

It is evident, as a result of these investigations, that there is a very high rate of trachoma prevalence among nearly all the Indians of the country.

INCIDENCE OF TRACHOMA ACCORDING TO AGE, SEX, AND DEGREE OF INDIAN BLOOD

It may be of interest to give a few figures as to the incidence of the disease according to the age, sex, and degree of Indian blood of those affected.

Age.—Of over 2,000 cases of trachoma in a group of 10,425 Indians examined, in which records with respect to age were kept and compiled, 4.5 per cent. were under 6; over 50 per cent. between 6 and 20 years of age, and the remainder over 20 years of age. It is evident from the preceding that those of school age are the greatest sufferers. The disease is very rare in infants under 1 year of age yet a few cases were found among babies less than 12 months old.

Sex.—In this same group of 10,425 the incidence was found to be slightly higher in females than in males. Of this total number 5,303 were males with 984 cases of trachoma, and 5,122 were females with 1,083 cases. The somewhat greater incidence among the females is only natural in view of the more domestic life of women and their more intimate association with the members of the family.

Degree of Indian Blood.—From the observations made, it was evident that the incidence of trachoma was

greater among the full-bloods than among the mixed-bloods examined. This may be attributed, however, to the more prosperous circumstances and the better living conditions which obtain among the mixed-bloods.

VISUAL DAMAGE DUE TO TRACHOMA

A complete census would have been necessary to determine the total amount of blindness due to trachoma among the Indians. Certain observations, however, were made and compiled in the case of 23,560 Indians examined. Of this number 5,505 or 23.4 per cent. had trachoma of which 527 showed, at that time, marked damage to vision. These injuries were of the usual type and consisted variously of corneal ulcers, corneal opacities, pannus, entropion with keratitis, perforation of the cornea with resulting evacuation of the contents of the globe, etc. In 141 individuals the damage consisted of blindness in one or both eyes.

These figures by no means represent the extent of visual damage among the Indians due to trachoma. It should be borne in mind that, in relatively few cases, among those of school age, had the disease progressed sufficiently to produce corneal complications, and the schoolchildren, numerically, were the largest class examined. Moreover, Indians suffering from marked visual disturbance were least accessible to examination and some of these unfortunates evaded the examiners because of their sensitiveness in regard to physical deformities, particularly blindness.

At least 90 per cent. of the complications found in the Indians I examined were observed in the reservation Indians, exclusive of school-children. This is only natural in view of the long duration and chronicity of the disease.

With respect to the types of the disorder encountered, a wide variation was observed, many of the cases being mild and easily amenable to treatment, while others were of the utmost possible severity.

ORIGIN AND DURATION OF TRACHOMA AMONG THE INDIANS

The length of time trachoma has existed among the Indians is purely a matter of speculation.

The finding of cases in which cicatricial tissue only was present, the fact that aged Indians with trachoma stated that they had suffered from "sore eyes" all their lives, the history given by some of having contracted the disease from a subject long since dead, lead us to suppose that the disease has been among them for at least a generation.

Clark is of the opinion that trachoma is doubtless of more recent origin than tuberculosis among the Indians, but has existed for many years.

So, while there is no question but that the disease is widely disseminated among the Indians and has existed for years, the source and date of its introduction must be conjectural.

INSANITARY CONDITIONS AMONG THE INDIANS AND THEIR BEARING ON THE PREVALENCE OF TRACHOMA

Climatic Influences.—Generally speaking, Indians inhabit healthful sections of the country, and the large majority of Indian reservations are situated where the soil is fertile, the elevation high and the percentage of sunny days great throughout the year.

The scanty annual rainfall, however, and the high winds lead to the occurrence of numerous dust storms. Added to this is the activity of the sunlight due to the great percentage of sunny days, the lack of trees, and the greater content of ultraviolet rays by reason of the

high elevation of most Indian reservations. Many Indians were encountered during the investigations whose eyes were sensitive to light and who sought protection by the use of smoked glasses. The irritation due to excessive light and dust leads to the frequent rubbing of the eyes with the fingers, thus rendering easy the transfer of infection from fingers to eyes.

The excessive severity of the winters also contributes to the dissemination of trachoma, as the Indian remains indoors a great deal during the cold season, in order to keep warm, and the personal contacts in his crowded cabin are prolonged and intimate.

Housing Conditions.—In his savage state the Indian lived an open-air, nomadic life and his tepees, while often dirty, were well ventilated.

Since the middle of the nineteenth century, however, the Indians have been confined to reservations and constrained to live in houses. They are still generally ignorant of the elementary principles of domestic hygiene required by a stationary abode. This does not apply, however, to all Indians, many of whom were found to be of unusual intelligence and good sanitary habits.

Their houses together with their domestic and social habits, however, play an important part in the dissemination of trachoma. The typical Indian house is a small, one-roomed frame or log structure, which, in over one-half the instances has a dirt floor. The average Indian family is large, four or five children being by no means uncommon. Personal privacy is generally unknown, and all live and sleep together in the crowded cabin whose doors and windows are carefully shut in the winter, for warmth, the windows being frequently nailed shut. Whatever washing of the hands and face takes place is done in a common wash-basin, and towels, when present, are used by all members of the family. The bed-clothing, consisting of quilts and blankets, is used, without washing, until worn out, and indiscriminately by the various members of the household. The scanty accommodations of the crowded cabin are likely to be further strained by the advent of visitors who, with true Indian hospitality, are welcomed and may stay days or weeks.

Discharges from the eyes and nose are usually removed by the fingers, which are inadequately wiped on the clothing or any convenient object. It was no unusual sight to see a trachomatous mother removing the secretion from the corners of her eyes with her fingers, and then endeavoring to assist the examiner in examining the eyes of her children.

Add, in the summer time the presence of numerous flies, and the sociable nature of the Indian which delights in visits and social gatherings of all kinds, and the wide-spread prevalence of trachoma among the Indians is readily accounted for.

THE PUBLIC HEALTH SIGNIFICANCE OF THE PRESENCE OF TRACHOMA AMONG THE INDIANS

The public-health significance of the presence of trachoma among the Indians has now become of considerable importance.

In former years the Indians were closely confined to their reservations and their intercourse with the white race was scant. The presence of trachoma among the Indians, at that time, while deplorable, wrought no injury to others than themselves. At present, conditions are about to be greatly changed. County after county on Indian reservations is being opened to white

settlement, and the day seems not far distant when the Indian will be merged in the general population. An infection, therefore, which menaces one of the essential senses of the body seems on the eve of being widely spread through territory in which, at present, it is confined to restricted areas.

In justice to the officers of the Indian service it should be stated that they are cognizant of these conditions and are doing what they can to control them. They have been hampered by lack of men and money, but have asked for liberal appropriations to control the spread of trachoma and treat those so afflicted. It is to be hoped that such funds will be forthcoming in the near future. In the meantime they have placed what men they could in the field to treat eye diseases among the Indians, and agency and school physicians in general are on the watch for the disease and treat as many of those afflicted as they can.

CONCLUSIONS

1. Trachoma is exceedingly prevalent among the Indians, the prevalence being (a) highest in Indian boarding-schools, (b) less in Indian day-schools, and (c) least among reservation Indians above and below school-age.

2. The origin and duration of the infection among the Indians is unknown, but its wide dissemination is readily accounted for by the housing conditions and want of the knowledge of personal hygiene among them.

3. The opening of reservations to white settlement and the foreshadowed absorption of the Indian by the white population renders the present wide-spread diffusion of trachoma among the Indians a serious menace to future white populations of Indian reservations.

TRACHOMA AMONG THE NATIVES OF THE MOUNTAINS OF EASTERN KENTUCKY

J. A. STUCKY, M.D.
LEXINGTON, KY.

For more than twenty-five years, a large and rapidly increasing number of cases of trachoma, with many of the devastating sight-destroying sequelae, have been coming to me from the mountains of eastern Kentucky. I was impressed with the genuineness, the simplicity, honesty and sincerity of the large majority of those so afflicted—and the fact that very few of them had the first rudiments of a common school education, indeed, few of them could read or write, and many were unfamiliar with the alphabet. Often I would see the patients only once—there being no funds to maintain them or provision of any kind available for keeping them in the hospital for treatment. After a few months many of them would return with complete destruction of the eye or with impaired vision beyond restoration.

Besides this class of cases many were brought with most extensive and complicated suppuration and destruction of the middle ear and mastoid process, with systemic, meningeal, auditory and psychic sequelae—also cases of pansinusitis of the nasal accessory sinuses, some with involvement of the anterior frontal lobe (the silent area) of the brain.

All of these cases came from an area in the heart of the mountains composed of seven counties. After investigation I found most of these counties were so-called "pauper counties"—with no money in the county treasury, and not so much as an almshouse. My "scien-