1919.

NEW ZEALAND.

PUBLIC HEALTH

AND

HOSPITALS AND CHARITABLE AID.

REPORT THEREON BY THE INSPECTOR-GENERAL OF HOSPITALS AND CHARITABLE INSTITUTIONS AND CHIEF HEALTH OFFICER.

Presented in pursuance of Section 76 of the Hospitals and Charitable Institutions Act, 1918.

REPORT.

The Inspector-General of Hospitals and Chief Health Officer to the Hon. the Minister of Public Health.

Department of Public Health, Hospitals, and Charitable Aid,
Wellington, 1st August, 1919.

Sir,—

I have the honour to lay before you the report of the Department for the year ended 31st March, 1919. The year has, without doubt, been the most outstanding in the history of the Department, because of the visitation of the deadly influenza pandemic.

This is the subject of a special article by Dr. Makgill, which appears as Appendix A hereto. Further, it is also dealt with in the report of the Royal Commission appointed for the purpose, so that I do not propose to enlarge further on the matter.

Following on the pandemic was the full realization of the restricted scope and power of the Department under the Public Health Act and the consequent necessity for fresh legislation. With what was done in the short space of time available to Parliament it is not possible to make great headway. The main feature of the new legislation was the setting-up of an advisory body known as the Board of Public Health, which, as a result of its deliberations, may help the Department to secure sanitary progress.

My proposals for reorganizing and strengthening the Department have already been placed before you in a memorandum of which the following is a precis:—

Reorganization of Department.

A conference of medical officers of the Department was called. After fully explaining the position in which the Department was situated and comparing it with other Departments of the State, which were in a very much better position as regards staff and organization, largely owing to their being revenue-producing Departments, those present were invited to give their opinions as to the best method of enlarging the scope and functions of the Department so that it might more effectually control epidemics such as the country had just experienced, and better carry out other duties imposed on it—at present impossible owing to the lack of sufficient medical officers.

Board of Health.—The Board of Health proposed to be set up as a result of the amendments to the Public Health Act passed during the last session was unanimously approved. The Chief Health Officer should be designated Director-General of Public Health, and be the Chairman of the proposed Board and the Chief Executive Officer. The Director-General of Public Health should be given extended powers to deal with the local authorities upon the recommendations of the Board of Public Health.

Statistical Officer.—A special medical officer should be appointed to control the work of compiling statistical information concerning the incidence of the various diseases throughout the Dominion and the localities in which prevalent.

Medical Officers of Health.—These should be directly under the control of the Department. Suggested that such officers should be detailed to certain local authorities for special work, and that a portion of their salaries should be recovered from the local authority. Such appointees should have special sanitary and bacteriological knowledge, and possess special qualifications in public health.

Inspection of Wharves and Shipping.—The inspection of wharves and shipping is very desirable, and Harbour Boards should be made local authorities under the Public Health Act.

District Health Officer, Dunedin.—It is desirable that the District Health Officer for Otago District should be Lecturer on Public Health at the University.

Sanitary Inspectors.—Sanitary Inspectors who are at present servants of Hospital Boards, and therefore only indirectly officers of the Department, should be wholly under the control of and paid by the Department. Much good would result by the periodical transfer of Inspectors from one place to another.

Institutions controlled by Department.—The unanimous opinion was that not one of the institutions under the direct control of the Department was to be compared with the institutions which were under the control of the Hospital Boards, either in equipment or general administration. This is a matter that should be remedied immediately, and the Department's institutions should be brought up to date.

Recasting the Public Health Act.—The desirability of having the Public Health Act remodelled is stressed, and an officer of the Department should be specially detailed to undertake this work, such officer to be relieved entirely of his other responsibilities for the time being only, in order to give his whole time to the work.

Health Districts.—The District Health Officers have to contend with many difficulties in carrying out their various duties, owing to the extremely large area of their districts. The number of health districts should be increased to eight, the subdivision to be as follows:—

(1.) North Auckland District, taking in the Hospital Board districts of Bay of Islands, Kaipara, and Whangarei	One medical officer to be stationed at Whangarei.
(2.) Auckland Health District, taking in Waikato, Thames, Waihi, Coromandel, Tauranga, Bay of Plenty, and Taumarunui ...	Two medical officers.
(3.) Cook Health District, taking in Waiapu, Cook, and Wairoa	One medical officer to be stationed at Gisborne.
(4.) Wanganui Health District, taking in Taranaki, Stratford, Hawera, Patea, Wanganui, and Palmerston North	One medical officer to be stationed at Wanganui.
(5.) Wellington Health District, taking in Wellington, Wairarapa, Hawke's Bay, and Waipawa	Two medical officers.
(6.) Nelson Health District, taking in Wairau, Picton, Nelson, Westland, and Buller ...	One medical officer to be stationed at Nelson.
(7.) Canterbury Health District, taking in Inangahua, Grey, North Canterbury, Ashburton, and South Canterbury	Two medical officers.
(8.) Otago Health District, taking in Waitaki, Otago, Vincent, Maniototo, Southland, and Wallace and Fiord	Two medical officers, one of whom should reside in Invercargill.

Both a senior and a junior District Health Officer should be stationed at each of the four centres.

Control of Consumption.—In addition to providing adequate sanatoria accommodation, some form of employment should be provided for those ex-patients whose condition warrants it. The system of farm colonies is worthy of consideration. The tuberculosis dispensary which has existed in Christchurch for several years past is a very useful institution, and a similar system should be established in other centres with a view to bringing cases in the early stages of the disease under proper care and attention. Cognizance should be taken of the valuable lesson taught by the results achieved at the C1 Camp established in connection with the Expeditionary Forces. It should be possible to devise means for giving persons who are weak-chested or otherwise physically defective a course of physical training either by means of classes or by camps.

Hospital Plans.—As regards the preparation of plans for hospital buildings and the consideration of those submitted by architects to Hospital Boards, the present system is unsatisfactory in that the medical officers of the Department have to give this matter their personal attention to the detriment of their other duties. The appointment of an architect to perform the preliminary work and report to the Inspector-General of Hospitals before that officer gives his approval to any of the plans submitted is very desirable, on the same lines as the appointment of the Consulting Engineer. There is sufficient work of this nature to keep such officers fully employed.

Sale of Foods and Drugs Act.—This Act should be administered in more detail than has been the case in the past, and an officer with chemical experience should be added to the staff at Head Office. Such an appointment would result in uniformity being secured throughout the Dominion in the administration of the Act, besides relieving District Health Officers of the more routine work arising therefrom. All laboratories in which any form of vaccine is manufactured should be licensed before being permitted to sell such vaccines.

Bacteriological Work.—All bacteriological assistants about to be appointed should be absolutely under the control of the Government Bacteriologist of the district concerned.

Medical and Dental Bursaries.—For last year eight medical bursaries were provided for fifth-year students, the conditions, in effect, being that the bursars are at the disposal of the Department for public-health or hospital work for two years after qualifying.

Up to the present ten dental bursaries have been granted, and the details of the scheme are now nearing completion. The objects and conditions are on lines similar to those for medical bursaries.

Departmental Journal.

The *Journal*, which was inaugurated by the direction of the Hon. the Minister of Public Health in July, 1917, has proved an eminently successful venture, and congratulatory comments have been received from time to time, the information disseminated by this means having been highly appreciated. The publication has served as an excellent medium between the Department and Hospital Boards. The work is at present undertaken by the Secretary's branch of the Head Office, and at times articles have been contributed by medical officers of the Department. Each month a summary of the Department's activities as regards the administration of the Sale of Food and Drugs Act and inspections is published in the *Journal*. Other standing features are statistics of infectious diseases, summarized reports of Hospital Boards' meetings culled from various newspapers circulating in the Dominion, and particulars and costs, &c., of additions and alterations to public institutions approved by the Hon. the Minister under section 61 of the Hospitals and Charitable Institutions Act, and several valuable articles have been prepared on matters in relation to Hospital Boards' book-keeping and accounts.

Public Health Act.

Infectious Diseases.

The following are extracts made from reports by District Health Officers:—

SCARLET FEVER.

Auckland.—"Scarlet fever was very much below the previous year, there being a decrease of 379 in the number of notifications."

Wellington.—"The figures for the year show a most substantial reduction, only 287 cases being notified, as against 848 for 1917. The disease was fairly general in its distribution throughout the health district, although it was noticeably light in its incidence on the provinces of Marlborough and Taranaki and the hospital districts of Waiapu and Wairoa."

Canterbury.—"The total number recorded (486) shows a decrease of 390 as compared with 1917. The highest incidence was recorded in May, and gradually declined towards the end of the year. In the previous year (1917) this disease was at its height in July. The disease was practically confined to the Canterbury portion of the district, very few cases having been reported from the West Coast; but this is probably due to the fact of more closely settled conditions in Canterbury, whereas on the West Coast the population is more scattered; also to the fact that Canterbury being a colder part of the district there is more tendency for people to box themselves up in ill-ventilated rooms. The disease was mostly of a mild type, six deaths being recorded, giving a percentage of 1·23."

Otago.—"In Southland Hospital District the number of scarlet-fever cases was rather less than during the previous year. A small outbreak occurred in the Queenstown district in May and June, but the prompt removal to hospital of these cases apparently checked the disease. Otherwise the cases were of a sporadic nature and fairly widely scattered over the whole district. Three deaths occurred. This disease has been characterized by the mildness of the attacks. In some cases the history is as follows: A child first reports for medical attention owing to peeling of the skin. Investigation then shows that the child had a slight rash and was off-colour for a day or so, but was not sufficiently ill to remain away from school. It is possible that many cases of this type have escaped detection."

DIPHTHERIA.

Wellington.—"Diphtheria was, next to influenza, the most widespread of the infectious diseases of 1918. No fewer than 2,919 cases were reported during the year, an increase of 378 over the figures for 1917. The disease was, fortunately, very mild in nature, and few fatalities resulted. In accordance with the usual experience that only one epidemic disease is widely prevalent at any one time, the advent of the influenzal wave of November caused a rapid diminution in the number of cases of diphtheria."

Canterbury.—"The total number of cases recorded (879) shows a decrease on the last year's figures of 182. 690 of these cases occurred in the North Canterbury Hospital Board's district, the remainder being scattered over the rest of the district, more or less in proportion to population. Several instances come under notice where the disease was distinctly traceable to carriers who showed no symptoms or history of having had the disease. The greatest incidence was in May, and remained fairly high until August, with a slight drop in June and July. Last year May, June, July, and August also showed the highest rate of incidence. Thirty-six deaths occurred, giving a percentage of 4."

Otago.—"Seven hundred and ninety-three cases of diphtheria occurred in this health district, and of this number 469 have occurred in the Southland District. The epidemic in the latter district appears to be now well under control, there being a decrease of 317 as compared with the

previous year. For the last three months Mr. Vivian, a medical student, has been acting as Bacteriologist to the Southland Hospital. In Otago Hospital District 199 cases were reported, as compared with 100 cases for 1917, an increase of ninety-nine cases. The majority of these cases have occurred in Dunedin itself.

"During the winter months, probably owing to the cold and wet weather experienced, a comparatively large number of cases occurred in Dunedin City.

"In the Southland Hospital District the epidemic of diphtheria which prevailed during 1917 continued well into the year under review, but a great decrease was noticeable during the last three or four months. At no time, however, were there so many cases as during 1917, and the total for the year showed a large decrease. The mortality rate remained fairly low, being rather less than 2 per cent., as only ten deaths occurred.

"In addition to the actual cases enumerated above, bacteriological examination of contacts discovered a large number of carriers. These were isolated as far as possible, and this fact may possibly have something to do with the improvement in the incidence of the disease over the year previous. An interesting feature in connection with this disease was the practically complete freedom from the trouble enjoyed by the eastern (*i.e.*, Gore, Mataura, &c.) district.

"In Hampden twenty-four cases of diphtheria occurred during the year, the mortality being very high. All the children at the local school have been swabbed on two occasions, and in one case a carrier was found."

ENTERIC FEVER.

Auckland.—"I am very pleased to be able to report a substantial decrease amongst the typhoid-fever cases. The cases are 120 less for 1918 as compared with 1917. I have heard it stated that the number of typhoid cases in a district is a very fair index of the general cleanliness of a district. It is a fact that where dirt and filth exist there infectious disease is most likely to develop, so that the large decrease of 120 must represent a considerable measure of improvement in the Auckland District."

Wellington.—"A most satisfactory position is disclosed in connection with this disease, only 110 cases being notified, as compared with 254 in 1917. The Waiapu Hospital District contributed 30 per cent. of the total cases, the reason being the large Maori population in this area and the marked susceptibility of the Natives to enteric fever."

Canterbury.—"Thirty-six cases were recorded, and occurred chiefly between January and April, the highest records being seven in February; nine in April. In proportion to population the West Coast suffered more than Canterbury. The cases, however, were chiefly of a mild nature, only one death being recorded. The total number of notifications showed an increase of five over that of last year."

Otago.—"There were twenty-one cases of enteric fever during 1918, nineteen occurring in the Otago Hospital District."

TUBERCULOSIS.

Auckland.—"Under this heading, too, we find a decrease of seventy-three. During the time that recruiting and the examination of all male adults under forty years of age was in progress we received a great many notifications of this disease, and upon making subsequent inquiries found that often the patients had no idea that they were so suffering. Early cases through this means have been detected, and in many instances got under treatment, that probably would have been much further advanced but for the military examinations."

Wellington.—"Only 299 cases were reported in 1918, as compared with 478 in the preceding year. It must be remembered, however, that the figures for 1917 were much above the normal, owing to the very complete medical examination of the males of military age and the consequent detention and notification of incipient cases. Possibly many cases were thus notified in 1917 who in the ordinary course would not have sought medical advice until much later, and would have been notified perhaps in the following years."

Canterbury.—"Two hundred and fifty-four cases were recorded, showing a decrease of ninety-five as compared with the figures of last year."

Otago.—"During 1918 220 cases of tuberculosis have been notified, showing a decrease of 107 as compared with 1917. The position with regard to this disease is satisfactory, there being a marked decrease in the incidence."

CEREBRO-SPINAL MENINGITIS.

Auckland.—"Cerebro-spinal meningitis shows an increase of fifteen cases over 1917, and of these eight occurred in Auckland City and the remainder in the country districts."

Wellington.—"This disease showes a marked increase when contrasted with the preceding year, 106 cases being notified in 1918, as against only twenty-four in 1917. Whether this increase is a direct result of the unusual prevalence of influenza is uncertain, but seems highly probable in view of the common association of the two diseases.

"The high figures for the Wairarapa Hospital District are due to the inclusion of cases from Featherston Military Camp."

Canterbury.—"Fifteen cases were notified, showing a large increase on the number for last year, when there were only three. These cases occurred in the latter half of the year. Of the purely civilian cases, in three of these there was a history of recent influenza, and in two instances at least there was evidence of overcrowded conditions in the homes. Seven of the cases proved fatal."

Otago.—"Seventeen cases occurred during the year, nine of which were reported in the Otago Hospital District. This is an increase of eight as compared with the figures for the last year."

Hospital Accommodation for Infectious Diseases.

The following additions and alterations have been approved by the Department during the year :—

Diphtheria ward and two-case isolation blocks at Wanganui; estimated cost, £7,247.
Pavilion for twenty-six infectious cases, Otago; estimated cost, £4,500.
One-case isolation and admission pavilion for six cases, Otago; estimated cost, £1,800.
Infectious-disease wards, outbuildings, and appurtenances, Waikato; estimated cost, £5,500.
Case isolation block of four single wards, to be erected in wood, with tile roof, on Waimate Hospital grounds; estimated cost, £950.
Nurses' Home, infectious-disease block, and laundry, at Thames; estimated cost, £12,500.
At Taumarunui—(*a*) Erection of new hospital, including Soldiers' Memorial Ward; (*b*) infectious block; (*c*) Nurses' Home; (*d*) laundry block; (*e*) furnishings for the above; (*f*) laying on water from Taumarunui Borough supply; (*g*) fencing, clearing, grassing, levelling, laying off grounds, and planting; (*h*) mortuary; (*i*) drainage; (*j*) stockyards, sheds, and implements; (*k*) cottage for caretaker and porter; (*l*) clerk of works, architect's fees, and travelling-expenses. Estimated cost, £31,000.

Bacteriological Work.

This important branch of the Department has commenced its better development under the "bacteriological trainees" scheme, as a result of which we shall be able to provide Hospital Boards with trained and efficient workers, and so in a great measure ensure prompt discovery, investigation, and control of infectious diseases.

Medical and Nursing Aid to Maoris.

The health of the Maoris is a matter that requires greater attention from the Department than has been possible in the past. I shall be guided and considerably assisted in this direction by Dr. Te Rangihiroa, who has lately been appointed as a full-time officer, as Medical Officer to Maoris. Already the expenditure under this heading is considerable. The amount expended during the year was £2,050, in addition to £3,000 voted on the Civil List. The following are the reports of District Health Officers on the sanitary conditions of Maoris :—

Auckland.—"If one may take the decreased number of cases of typhoid fever as an index the Maori population must have made progress in their sanitary surroundings. When inspecting Maori districts every now and then one is struck with the improvement, and the increasing numbers of this race that flock to the towns must learn that the old-time rural practices of the Maori must give way to the improved sanitary methods of to-day. More probably depends upon the headman of a Maori district than is generally given credit for. If he is an educated and at all up-to-date man in his ideas his tribe gets the benefit of his modern ideas, and he is more ready to listen to advice that may be in the future beneficial to his tribe."

Wellington.—"The sanitary conditions of the Maoris are steadily improving. In some districts the standards of living of the Natives are as good as those of the white population. Tangis, huis, and other Maori gatherings, however, still continue to be a source of anxiety to the Department."

Christchurch.—"Taken as a general rule the Maori pas are fairly well kept, and there is no doubt that the visits paid by the District Nurse have a marked influence in the maintenance of cleanliness and order. Some habitations have called for condemnation, and it is often a slow process to get Maori dwellings pulled down and rebuilt, owing to complications in the matter of ownership."

Otago.—"During the influenza epidemic Inspector Ellison was appointed to look after the Maoris in this health district. In the course of his duties he travelled to the various Maori settlements, and in his report he informed me that the Maoris had not been very seriously affected by the epidemic.

Quarantine-stations.

Since the cessation of hostilities the Department has been able to resume control of the quarantine islands. There has been little existing by way of modern equipment at these stations, and the necessity for such has been strongly amplified during this eventful year. With all possible haste endeavour has been made to provide for reasonable future eventualities. There is now ample accommodation and equipment at Motuihi for 300 persons. At Somes Island plans have been prepared for the erection of a brick hospital to accommodate fifty patients. For the present one-half will be completed to accommodate twenty-five patients, and there will be in addition accommodation at the island for 500 persons.

Treatment of Consumptives.

The policy decided on is that the institution at Te Waikato should not be extended, or any money spent on it meantime more than is required to maintain it in its present state. Other institutions are required; for example, one on the west coast of the North Island and one in the South Island. The last-mentioned would provide for Hospital Board cases from and around South Canterbury. The Auckland Board is also considering the establishment of an institution available to the adjacent Boards, and the two other departmental institutions in the North Island will be similarly available. A point I wish to make is that these institutions should only be available to incipient cases, as it is almost useless to attempt assistance for advanced cases. These should be accommodated in shelters adjacent to the various hospitals, so that the unfortunate patients may be permitted to end their days as near as possible to relatives and friends. This subject is also dealt with under the heading "Infectious Diseases."

General.

Other matters referred to in the Reports of District Health Officers are:—

GENERAL SANITARY CONDITIONS OF DISTRICTS.

Auckland.—"Owing to the great increase all round in the cost of materials, and the difficulty of finding money for large schemes of improvement such as sewerage and water-supplies, there have been no large sanitary works started during the year 1918. The increasing difficulty of finding sanitary depots, and also of men willing to undertake nightsoil-removal work, makes the provision of the water-carriage system of sewerage more necessary, and there are several places in this district which would derive distinct benefit from such works; Pukekohe, Huntly, Waiuku, and Thames are four examples.

"I have noticed in several towns when visiting them that there has been a tendency to fall back in the question of street-cleansing. The difficulty of obtaining labour and its increased cost are the excuses, but increased sickness and spread of disease will be the penalty if more attention is not paid to this necessary work."

Wellington.—"There has been little tendency on the part of local bodies to undertake works of any magnitude during the year just ended. Small extensions to existing drainage-works have been carried out in Hawera, Patea, Waipukurau, Napier, Hastings, and Petone.

"Generally speaking, the sanitary condition of the district is satisfactory. The scarcity of labour and the lack of building materials have resulted, however, in the erection of very few new houses. Consequently there is at present an acute shortage of housing-accommodation.

"New sanitary by-laws have been drafted by the boroughs of Wanganui, Dannevirke, Marton, and Shannon, and the Town District of Bull's, and have been approved by the Department. The boroughs of Karori, Featherston, and Masterton, and the town districts of Raetihi and Opunake, have been granted advice and assistance in the direction of framing suitable by-laws."

Canterbury.—"Taken as a whole the sanitary conditions of the district are fairly satisfactory, though conditions from time to time come under notice which indicate that there is still room for improvement.

"The termination of hostilities will no doubt enable work to be carried out which has been in abeyance for the last three or four years, especially in connection with the provision of sewerage in the suburbs of Christchurch and the larger country towns.

"Ashburton is moving in this direction, and it is to be hoped that before the end of the year a scheme will be in operation, or well on its way thereto."

HOTEL-INSPECTION.

Auckland.—"As has been the custom in previous years, the hotels have been inspected and reported upon before the licensing meetings. The bulk of the hotels are in very fair sanitary condition, and the Health Department has much less trouble in getting improvements done amongst the hotels than in any other section of the community."

Wellington.—Hotels inspected, 339; satisfactory, 200; alterations and recommendations carried out, 139.

Canterbury.—"A number of the hotels were inspected, but owing to some misunderstanding this was not as generally carried out as usual, being somewhat complicated by the view taken by some of the Hospital Boards, who control the Inspectors, as regards their relations with the Licensing Committee. I do not anticipate any difficulties this coming year, but there is no doubt the whole matter would be very much simplified if the Inspectors were directly under the control of the Department. There would then be no question regarding the duties to be performed.

"The total number of hotels inspected was sixty.

"The number of these in which alterations were recommended and carried out was fifty."

Otago.—"No special inspections of licensed hotels were carried out, but a large number were inspected during the year in the course of the Inspector's ordinary visits to the various localities."

OFFENSIVE TRADES.

Auckland.—"Fewer complaints have been made against the owners of offensive-trade premises than in previous years, with the exception of one district. The large works have been carried on with very little complaint, and where up-to-date plant has been established no trouble has ensued. In one instance where a small plant is run by one or two men we have had numerous complaints, and inspection nearly always revealed the fact that the cleaning-up had either been forgotten or else only partially done. A threat to cancel the permit had an excellent effect. Complaints about slaughterhouses used to be very common, but at the present time are few and far between. The disappearance of many of the small private slaughterhouses, and the growth of the large killing companies, whose works are well built and designed for the work, has been the cause of this decrease in complaints."

Wellington.—Premises inspected, 66; satisfactory, 59; unsatisfactory, 7.

Otago.—"No new offensive trade was established during the year. Inspections of rabbit-canning factories and boiling-down works at Burnside were carried out. At one rabbit-canning works a large number of rabbits in a decayed condition were condemned.

PUBLIC HEALTH INSPECTIONS.

Auckland.—Two hundred and thirty-one vessels inspected during the year. Of these ships twelve had specific disease amongst the crew; two had cases of tubercular disease amongst crew and passengers, whilst three had cases of influenza.

Wellington.—Two hundred and forty-four vessels were inspected.

Canterbury.—Ninety-six vessels were inspected. One had a case of cerebro-spinal meningitis, which was removed to the hospital and died. Four had cases of tuberculosis. Four had cases of syphilis. One had a case of face lupus, and another a case of retrobulbar optic neuritis. These were reported to Customs, as were others in which such course was necessary.

Otago.—Fifty-six vessels were inspected.

Hospitals and Charitable Institutions Act.

Owing to extreme pressure of work under the Public Health Act since my rejoining the Department it has been impossible for me to make as many inspections of institutions as I would wish. It has long been apparent to me that the present system of inspections requires alteration, and in my reorganization proposals I am advocating that more of this work be placed with District Health Officers. If the staff additions, both professional and clerical, can be arranged the proposals should be quite effective and efficient. I should like to pay a tribute to the work of Dr. Frengley in connection with the planning of additions and new buildings at institutions. Dr. Frengley makes a special study of these requirements, and is *au fait* with modern planning, ventilation, and sanitary requirements. He is thus able to render extremely useful service to Board's architects and to see that the Department is not committed to approving anything in hospital expenditure that is not absolutely sound. What I would like to ensure is more attention being paid to seeing that plans, as approved, are strictly carried out. It is not always possible to do this at present.

A proposal has been laid before you to strengthen the hands of the Department in the supervision of hospital plans by the addition of an Architect to the staff, who will specialize in hospital and institutional work, and relieve Dr. Frengley of much detail in this respect. It is obvious from a glance at the amassed schedule of work that to attempt to centralize the preparation of plans and the supervision of building-work would necessitate the appointment of a very large staff. Only supervision of the work of the Boards should be attempted, at least for the present, and in this the service of an Architect will be of great value.

Another officer invaluable to the Department in hospital work is Mr. J. H. Anderson, Consulting Engineer. Mr. Anderson is advanced in heating and lighting problems, and many of his reports on existing work, as well as suggestions on proposed work, are mines of valuable information and guidance.

The following is a schedule of additions, alterations, and improvements to hospital establishments approved by the Department during the year :—

New wing to Nurses' Home, Auckland Hospital, to provide accommodation for seventy-five additional nurses; estimated cost, £22,000.

Additions to the laundry and to the Nurses' Home, Hawera Hospital; estimated cost, £840.

New general ward at Masterton Hospital, and additions to Nurses' Home, Masterton Hospital; estimated cost, £5,530 and £7,400 respectively.

New General Hospital at Nelson; estimated cost, £33,158.

Maternity Hospital at Nelson; esimated cost, £8,842.

Nurses' Home for isolation hospital, Otago; estimated cost, £4,500

Mortuary, disinfecting-room, storeroom, steeping-room, Otago; estimated cost, £500.

Patients' undressing-room, bathroom, waiting-room, Otago; estimated cost, £350.

Extension of existing laundry building for the accommodation of laundry machinery at the Gisborne Hospital; estimated cost, £500.

Extension of Gisborne Borough Council electric-lighting system from borough boundary to the hospital; estimated cost, £283.

Morgue at the Christchurch Hospital for accommodation of twelve bodies, post-mortem room, disinfecting-room, viewing-room, and waiting-room; estimated cost, £2,500.

Asphalting of paths and drying-ground, and improvements to sewage system, Otamatea; estimated cost, £270.

Enlargement of water-main and installation of a service of fire-fighting appliances, Masterton; estimated cost, £1,250.

Extension of laundry accommodation by addition of a second floor, Christchurch; estimated cost, £1,150.

Additional story to King Edward Pavilion, Dunedin, to provide additional accommodation for soldiers; estimated cost, £6,988.

Erection of balconies at the Nurses' Home, Gisborne Hospital, and reinforcement of roofs of hospital verandas; estimated cost, £1,175.

Erection of Cottage Hospital and Maternity Home for the Oxford district, North Canterbury, giving accommodation for five maternity cases, two female and two male casualties; estimated cost, £3,200.

Alterations and additions to Whangarei Cottage Home, to be used as a maternity hospital; estimated cost, £700.

At Wairarapa: (*a.*) Erection of a ward for twenty-one patients; (*b*) two two-bed wards; (*c*) workshop; (*d*) billiard-room and sitting-room; (*e*) rooms necessary to the above; estimated cost, £11,000.

Erection of a brick and concrete building to contain all the kitchen offices and sleeping-accommodation for the female, domestic, and male staff of the Napier Hospital; estimated cost, £9,830.

Sitting-room for women and locker-room for patients' clothes at the Cashmere Hills Sanatorium, Christchurch; estimated cost, £370.

Alterations and additions to present laundry, to provide for the inauguration of a steam-laundry, Wairarapa; estimated cost, £700.

Nurses' Home at Timaru Hospital, to be built in brick and concrete, with concrete partitions. To accommodate Matron and thirty-eight nurses; estimated cost, £9,000.

Nurses' Home, infectious-diseases block, and laundry, Thames; estimated cost, £12,500.

At Taumarunui: (*a*) Erection of new hospital, including Soldiers' Memorial Ward; (*b*) Nurses' Home; (*c*) infectious block; (*d*) laundry block; (*e*) furnishing for above; (*f*) laying on water from Taumarunui Borough supply; (*g*) fencing, clearing, grassing, levelling, and laying off grounds, and planting; (*h*) mortuary; (*i*) drainage; (*j*) stockyards, sheds, and implements; (*k*) cottage for caretaker and porter: (*l*) clerk of works, architect fees, and travelling-expenses; estimated cost, £31,000.

Nurses' Home, Taranaki, to accommodate forty-eight nurses and six maids; estimated cost, £6,500.

New ward at main Hospital, Wellington, and addition to sick nurses' quarters; estimated cost, £6,500.

Erection of Cottage Hospital at Oxford, North Canterbury; estimated cost, £4,003.

Erection of Maternity Home Cottage Hospital at Waikari; estimated cost, £4,500.

Alterations to residence at Caversham, Dunedin, for use as Childrens' Convalescent Home; estimated cost, £1,500.

At Southland: First, pavilion, two-storied, with side ward and main corridor between same, to take sixty beds; also with main arterial corridor from Octagon Hall (single-storied only in the meantime); laundry block and equipment; kitchen and central apartments; Nurses' Home, and covered ways to same; medico's dining-room for nurses' use. Estimated cost, £37,600.

Dwellinghouse consisting of five living-rooms, three bedrooms, kitchen, and usual accessories for House-manager, Hamilton; estimated cost, £900.

Alterations and additions to the property known as "Holmdale," Wairau, for the purposes of a Maternity Hospital; estimated cost, £2,779.

Sanitary annex, Waimate Hospital; estimated cost, £500.

Maternity and Child-welfare.

Hospital Boards have been advised to consider the question of setting up Committees under section 64 of the Hospitals and Charitable Institutions Act with a view to attending to the health of expectant mothers and of young children. Several Boards have attempted to deal with this important question, while others are not sufficiently sure of their powers and scope. In my opinion, there is already sufficient organizations in the Dominion to adequately deal with the problems under the above heading. At present we have (*a*) St. Helens Hospitals; (*b*) Plunket Society; (*c*) Society for Protection of Women and Children; (*d*) efforts by Hospital Boards to establish maternity hospitals throughout their respective districts; (*e*) appointment of departmental District Nurses and Midwives; and (*f*) instances of where Boards have established homes to deal with single women and wives of poor men who cannot afford to enter nursing homes. In addition, the Department has published "The Expectant Mother and Baby's First Month" and "Feeding and Care of the Baby." All these things are at present only for those who seek them. Any organization decided upon should not overlap any of the work undertaken by the above bodies, but rather should be a body having some authority to investigate judiciously the conditions under which expectant mothers and infants are living. When it is seen that advice or assistance is desirable or necessary there should be some means to bring such cases to a point where they can be followed up by one of the bodies enumerated above. By this means care could be taken of those unable or unwilling to care for themselves.

Sale of Food and Drugs Act.

The existing regulations have been sufficient to afford, indeed, a strong measure of protection to the public as aimed at in the Act, but out of past experience and in the light of modern scientific development it is necessary to make extensions which are being drafted as opportunity will allow. A great deal more work could usefully be devoted to this Act and its regulations. Especially is this the case with Inspectors in the various districts, but as these officers usually combine duties under the Public Health Act as well, there are frequently occasions when food and drugs work cannot receive due attention. There should be more Inspectors.

Quackery Prevention Act.

This is another Act that does not receive its proper measure of attention. Although the scope of the Act in some instances appears rather open to controversy, I believe that more protection could be given for the public than at present by toning down to a great extent some of the extravagant claims appearing as advertisements in the daily newspapers. I noticed during the year a case of a successful prosecution by the police, independent of this Act. The case related to a rheumatism-cure, which was effectually dealt with as fraud or misrepresentation under the Crimes Act. Given more facilities for this work (along with other work as mentioned herein) and with closer co-operation with the Police Department a very useful and necessary service in the desired direction could be undertaken.

Social Hygiene Act.

Prevention and Treatment of Contagious Diseases.

The Social Hygiene Act has been found in its present form to be insufficient to give effect to its full intentions. In carrying out as far as possible the spirit of the Act the selection and appointment of health patrols is proceeding, and a new confidential branch of the Department has been established under a medical officer who has had considerable experience in venereal diseases in connection with troops overseas. The object is to establish clinics and give treatment at all hospitals throughout New Zealand for civilians as well as soldiers suffering from venereal diseases. A careful record of the movements of every soldier so afflicted is kept after his discharge from the Forces, but everything is done without ostentation or publicity in any way, so that all sufferers in the community may be encouraged and helped.

Poisons Act.

This Act requires some amendment, and the necessary points are being assembled with this view.

Plumbers Registration Act.

Three meetings of the Plumbers Board constituted under the Act were held during the year.

The Board held examinations under the Act in July and December, 1918. Fifty-nine candidates presented themselves, the results being as follows: Fifteen candidates qualified in the theoretical part and thirteen in the practical part. As a result of this sixteen new names were placed on the register, the persons concerned having qualified or completed in both parts of the examination. In addition, one other plumber was admitted to registration during the year under section 7 (1) (*c*) of the Act.

At the end of the year 1,270 names had been entered in the register since the commencement of the Act. Out of this total thirty-one names have been removed—eighteen through death in ordinary civil life, and thirteen through death on active service.

With the demobilization of the troops a great many late applications for the annual certificate or "ticket" have been made for the current year. There is also evidence of increased attention to the Board's examinations, and the figures respecting candidates being dealt with during the current year will show a marked increase on the year under review.

The Department has recently issued in booklet form a "Guide for Sanitary Plumbing," containing a copy of the Act and its regulations, also suggested answers to questions set in the Board's examinations. The answers were compiled gratuitously by Mr. John Clark, of Auckland, a registered journeyman plumber and a recognized master in his craft. The thanks of the Department are due to Mr. Clark, to whom I note you have already expressed your appreciation.

Staff.

I regret that my report has to record the sad loss the Department has suffered during the epidemic from the deaths of Dr. Pollen, Port Health Officer, Wellington; Dr. O'Sullivan, Assistant District Health Officer, Auckland, who had recently joined our Department and who had shown promise of great ability; and of Dr. Henly, Port Health Officer, Napier, another medical officer who lost his life in the service of the public. To the relatives of these officers the Department extends their sincere condolences.

Owing to the absence on military duty of Dr. Makgill and myself a very undue amount of work fell on Dr. Frengley, to whose exceptional ability we owe it that the Department was able to carry on during a very busy year. During the earlier stages of the epidemic, when he was detained at Auckland and Dr. Watt was incapacitated by influenza, the burden of work at Head Office fell on Miss Maclean, Assistant Inspector of Hospitals, and her assistant, Miss Bicknell. Special praise is due to the heroism of these ladies in carrying out the organization of measures to combat the epidemic, working thereat ceaselessly night and day without thought to their personal comfort or safety. It is not possible to estimate the measure of indebtedness which the Dominion owes to their self-sacrificing devotion.

The Departmental staff generally, short-handed and depleted by sickness as they were, rose splendidly to the occasion, and undertook readily any duty which presented itself as being needful of accomplishment, working thereat long hours and often at considerable personal risks. The Department generally has had many criticisms hurled at it, so it is but fair that the other side of the picture should be placed before the public.

Reports attached.

I attach hereto a report by the Secretary, Mr. E. Killick, on the financial workings of the Department, making special reference to the influenza-epidemic expenditure. The report of the Assistant Inspector of Hospitals and Deputy Registrar of Nurses, Miss H. Maclean, is also attached.

I also enclose a report by the Acting Government Bacteriologist, Major T. R. Ritchie, M.B., Ch.B., on the work done in the Wellington Laboratory.

I have, &c.,

T. H. A. Valintine,

Inspector-General of Hospitals and Chief Health Officer.

NURSES REGISTRATION ACT, MIDWIVES ACT, MATERNITY HOSPITALS, AND PRIVATE HOSPITALS.

The Assistant Inspector of Hospitals and Deputy Registrar of Nurses to the Inspector-General of Hospitals and Chief Health Officer.

Sir,—

I have the honour to report on the Nurses Registration Act, 1908; the Midwives Act, 1908; and Part III, Hospitals and Charitable Institutions Act, 1908.

During the last few years the number of candidates for the Nurses' Examination has greatly increased, the number in 1913–14 being 191, and in 1918–19 being 288. This is greatly due to the increased accommodation at the various district hospitals, necessitated by the return of sick and wounded men from active service, the policy of the Government having hitherto been to send these men for treatment to the general hospitals of their own districts rather than to special military hospitals.

The hospital authorities have greatly complained of the shortage of senior qualified nurses fitted to take charge of important wards and to train the juniors, and it may be that the probationers in training during the years of the war have not had the same advantages in this respect as previously. The senior sisters being constantly called up for military service have left gaps to be filled by nurses only recently qualified and without experience in teaching. As the best were needed for the care of the sick and wounded this was inevitable, but now that these seniors are returning it is for the Hospital Boards to secure their services and to adequately recompense them.

Hospital Boards have approached the Department with requests for a uniform scale of salaries to be drawn up, so that one hospital may not be under disadvantages as against others. The question of salaries may well be considered, but should only be at the upper end of the scale. Probationers who are receiving a valuable training should receive merely pocket-money, but their teaching, for which, and not for pay, they give their services, should be brought up to a uniform high standard. To do this Boards must realize it is their duty to properly pay the teachers and so make it worth the while of those who are paid for this work to specialize in it.

The whole burden of teaching and lecturing should not be left to a busy Medical Superintendent, the honorary physicians and surgeons at the larger hospitals, or to the junior house surgeons, who do not fully understand what is required, and to the busy Matron and ward sisters. Special lecturers in the various subjects contained in the syllabus issued under the Nurses Registration Act should be engaged and paid, so that in addition to what teaching is given by the Matron in her lectures, and by the sisters in the practical work of the wards and theatres, the pupils may have the full attention of one senior sister specially engaged as a tutor sister, whose duty would be to supervise the probationers' work, examine them periodically, and take in hand any who need individual training.

The demobilization of the Army Nursing Service is now going on, and there will be many experienced nurses not required for the permanent service available for hospital work who could well fill such posts. One sister has already been appointed by the Dunedin Hospital as surgical tutor, and the result of her work will be awaited with interest.

The provision of nursing assistance for country districts has been a very acute difficulty. It is proposed that the Department should retain a number of nurses for Public Health service, and among these some who can be sent to fill positions in the country, for which it is frequently very difficult for the local committees to secure nurses.

The late epidemic of influenza occurred at a very unfortunate time for the Dominion on account of the large number of nurses, over 500, then still away on active service. Those nurses who were themselves not ill did splendid service, but, unfortunately, very few did not contract the infection within a short time. The hospital staffs suffered greatly, quite three-quarters of the total number of nursing staff being off duty together, either acutely ill or convalescing. The death roll among trained nurses and probationers as well as among doctors was heavy. Had it not been for the services of voluntary helpers, both men and women, boys and girls, who came from offices and shops, colleges and schools, as well as from private homes, and did what they could, the sick would have lain almost unattended. The number of trained nurses available was not more than one to fifty or sixty patients. Too high commendation cannot be given to those who took up this unaccustomed work and laboured night and day to do their best to relieve the terrible suffering. The large camps near Wellington were very heavily visited, and the death rolls were large. One military sister died, and others were dangerously ill.

Since the cessation of the epidemic and with the possibility of a recrudescence there has been a movement to spread as widely as possible some knowledge of elementary nursing. The ignorance of the simplest measures of caring for the sick was rather astonishing in consideration of the general adaptability and efficiency in domestic work of the colonial woman. Few persons could correctly read a thermometer, but, after all, as this little instrument is not a household possession this is not surprising. Some of the hospitals have offered to take in young women for short periods of training in the wards. The advantage of this to these women is questionable, and the disadvantage to the regular probationers is unquestionable. The Department could not countenance the practice in the training-schools except during the time that a recurrence of the epidemic may still be looked for. Rather is it desired that the course given by the St. John Ambulance Society should be extended to a larger number of people, and that centres should be formed and classes held in every town in the Dominion. To further this object the Department has appointed nurses, who will be sent at the request of any centre forming a class, to give practical demonstrations of,

and as far as possible teach, the procedures of minor nursing. The Women's National Reserve has taken full advantage of this assistance in Wellington and Auckland, and besides the nurses engaged for the purpose several nurses returned from active service have during their leave volunteered to hold a class. The outside towns will be visited in due course. While lectures by medical practitioners are certainly of great value, it is felt that what is really required is more the simple practical teaching of a nurse.

In the larger centres the St. John Ambulance Society has its own nurse, and has also arranged for lectures from a doctor. It is hoped that this work may be extended. It was found that the members of the society who had gone through their nursing course were of great assistance to the trained nurses, but their experience is not sufficient to qualify them as teachers.

The military hospitals are now taking in young women as paid V.A.D.s, and in after-years when no longer needed for these hospitals the knowledge gained in them will be of great use.

The demobilization of the military nurses is now proceeding, and probably all the nurses will be back before the end of the year. Many of those who went away have married, and still a number are to be married after demobilization. The Hospital Boards have requested that as many nurses as possible may be released for civil positions, and this is being done as the various drafts return.

Native Health Work.

The number of nurses engaged in this work is gradually increasing, and with so many more nurses available it is hoped to increase this staff. With a doctor attached to the Public Health service specially for Native work, it is probable that more districts will be found requiring nurses. There are now eighteen nurses for Natives. Sister Jean Cormack, who has been absent for over four years on active service, returned to her district at Te Karaka in April.

Plunket Nurses.

This work goes on increasing. The difficulty of getting nurses for the positions has been a drawback, but should not now be so. The new Karitane Home for babies in Christchurch is doing good work. There is to be a similar home in Wanganui opened in the near future. What is greatly needed in this work is a senior nurse supervisor to visit all the centres and direct the work of the nurses.

Midwives Act, 1908.

During the year there have been two examinations of midwifery nursing. Ninety-nine candidates sat for examination, and ninety-five passed and are now registered. Seven were registered from overseas.

These midwives are still reluctant to settle in country districts. The Department is appointing a few under salary where it is unlikely for a time a woman would make a living. Four St. Helens midwives have been already started, and other districts are shortly to be opened. This is a very useful way to assist maternity cases unable to enter the State maternity hospitals, and it is hoped to greatly extend the work.

State Maternity Hospitals.

I would like to emphasize my belief that provided there is resonably comfortable accommodation in the homes of the expectant mothers the large majority of confinement cases do not need to come into hospital, and that the provision of maternity wards and hospitals should be made only where there is a large working population without comfortable surroundings. The expense of having to pay a doctor's fee as well as that of a nurse, who frequently is untrained, is what the less well-to-do class feel the greatest burden.

I think the Government by continuing to train, in the St. Helens Hospitals established where they are really needed, a sufficient number of midwives to admit of the country districts being supplied, each according to its needs, with trained women who will go into the homes and carry out the function for which they are trained (that is, to take normal cases without a doctor) will better meet the wants of the people than in any other way.

Hitherto the intention of the Midwives Act has not been fully carried out. Competent midwives have been trained in large numbers—over five hundred during the twelve years, and the number increases each year; but they have not acted as midwives, merely as maternity nurses working under doctors. One reason of this is reluctance on the part of many to take the responsibility of acting without a doctor, and fear that by so doing they would alienate the medical profession, which so far has strongly discouraged women from working independently.

Midwives have not to any extent settled in country districts. Few, after completion of training, have the necessary capital to pay expenses and wait for work. The only way in which to provide country districts is for the Government, either directly or indirectly through the Hospital Boards, to pay the salaries and living-expenses of the midwife and, where necessary, of an assistant. The fees charged the patients should go a long way towards paying expenses, and the midwife herself would be in a secure financial position, and so be able to take cases whether they can pay her or not.

We have now seven District Midwives established, and if they prove a success and are made good use of I should recommend largely increasing this branch of public-health work, which can include not only actual obstetric work, but the ante-natal and infant-welfare work as well.

In the St. Helens Hospitals, Auckland, Wellington, Christchurch, Dunedin, Gisborne, and Invercargill, 1,129 cases were confined during the year; 1,123 children were born alive, and forty-nine still-births.

There were eighteen maternal deaths, and twenty-six deaths of infants. (This largely increased maternal death-rate was due to the influenza epidemic. Few mothers, who were confined while suffering from influenza and nearly always with the complications of pneumonia, recovered.) There were also attended 521 outdoor cases. No deaths of mothers and infants.

Seventy-six pupils were trained during the year, and seventy-three registered; thirty-one now in training.

The plans are now being prepared for a new St. Helens Hospital in Christchurch. An additional piece of land was purchased, and the building is to be erected on the present site. The building will consist of new wards, labour-room, nursery, sitting-room for mothers, and all the usual adjuncts. The old outbuilding will then be used as a Nurses' Home and administrative block. The accommodation for the staff is now more comfortable, as they are housed in a cottage in the grounds, instead of a house some distance down the street. This St. Helens was fortunate in having no deaths from influenza. There were 219 admissions in the hospital and 181 outdoor cases; two deaths from nephritis and septicæmia.

The St. Helens Hospital, Dunedin, is now to receive medical students into its labour ward. The earnest representations of the Dean of the Medical School and of the students as to the impossibility of their obtaining the necessary experience in obstetric work at the Batchelor Hospital alone were carefully considered by the Department, and it was felt that, despite the great difficulty of maintaining a training-school for midwives as well as for medical students, an effort must be made to help the medical school to provide the requisite number of cases for each student. Owing, however, to the promise of the Right Hon. Mr. Seddon, when these hospitals were first established that the women for whom they were intended would not be attended by medical students, it has been arranged that the consent of the patient to a student attending her is obtained when making application for admission. The Department is reluctant to depart from the original intention of the State maternity hospitals, except in the case of Dunedin, on account of the presence of the Medical School there and the large increase of students, to go thus far at least towards meeting the needs of the school. There was one death from influenza and one from endocarditis.

The accommodation for staff has been greatly improved by the renting of an adjacent house. There were 121 admissions and sixty-one outdoor cases.

The Invercargill St. Helens has justified its establishment. The small number of beds is kept well filled, and the popularity of the institution is evidenced by patients returning the second time. Until the close of the war the Hospital was carried on under the sole superintendence of the Matron, who called in a doctor when abnormal cases required his attendance. Dr. McGibbon has now been appointed Medical Officer. There were three deaths from influenza.

Of Wellington St. Helens there is nothing special to report. As at the other centres, the influenza epidemic increased the usual low maternal mortality, there having been three deaths from influenzal pneumonia as well as two from septicæmia. The numbers of admissions have kept up fairly well, but also owing to the effects of the epidemic, during which many women miscarried, they were lower than last year by twenty-three. The number of admissions was 321 and ninety-four outdoor cases.

Auckland St. Helens has had a very busy year. The numbers of indoor patients have increased by nine. The Matron, Miss Broadley, after a very strenuous time was worn out and resigned her position. She was granted three months' leave on retirement, but after this holiday the Department was glad to receive her application to return to her position. Sister King managed well during the Matron's absence. It is hoped that now the war is over the long-contemplated new hospital wards may soon be built. There were 264 admissions and 183 outdoor cases. There were five maternal deaths; three from influenzal pneumonia.

Gisborne St. Helens has had a quiet year. The fact of the Salvation Army Home taking married women with their children, and also the fact that patients engaging private doctors are now not admitted, has decreased the number of cases. It does not now appear necessary to increase the accommodation, though the convenience of the place might be improved. Dr. Williams who was away on active service has now resumed his position of Medical Officer. There were no deaths from influenza; one from cardiac embolism. Ninety-two cases were admitted.

Hospitals under Hospital Boards, etc.

Batchelor Maternity Hospital, Dunedin: For the year ending 31st March, 1919, the number of patients confined was 126. 112 children were born alive, fourteen still-births, and one maternal death. Six midwives were trained and registered during the year.

McHardy Maternity Home, Napier: There were 141 confinements. 134 children were born alive (including one set of twins), eight still-births, and no maternal deaths. Four pupils were trained and registered.

The Maternity Home, Blenheim: Eighty-two patients were confined. Eighty-four children were born alive, and three still-births. There were three deaths of infants, and no maternal deaths. No pupils were trained.

The Essex Maternity Home, Christchurch: Twenty-one patients were confined. There were no maternal deaths, no deaths of infants, and no still-births. One pupil was trained and registered.

The Alexandra Home, Wellington: There were ninety-nine births in the Home, and 102 in the district. Three deaths of infants, and two of adults (from influenza). Six nurses were trained and registered.

Salvation Maternity Hospital, Gisborne: There were forty confinements. Thirty-seven children were born alive, and three still-births. There were no deaths. No pupils were trained.

Salvation Maternity Hospital, Auckland: There were forty-eight confinements. Forty-four children were born alive, and four still-births. There were no maternal deaths, and three deaths of infants. No pupils were trained.

Salvation Maternity Hospital, Roslyn: There were forty-one confinements. Forty children were born alive, and one still-birth. There were no maternal deaths, and five deaths of children. No pupils were trained.

Salvation Army Maternity Hospital, Kensington Street, Wellington: Fifty-two patients were confined during the year. Forty-seven children were born alive, and five still-births. There was one maternal death (from influenza), and three deaths of infants. One pupil was trained and registered.

Salvation Army Bethany Home, Napier: There were thirty-four confinements. Thirty-two children were born alive, and two still-born. There were three deaths of infants, and no maternal deaths. One pupil was trained and registered.

Salvation Army Maternity Home, Christchurch: There were twenty-three confinements. Twenty children were born alive, and four still-born. There were no deaths of infants, and one maternal death (from influenza). No pupils were trained.

Massage.

During the past year the extension of the training of students for the above work has been great. Owing chiefly to the fact that so many masseuses are required for the treatment of soldiers, a great many young women have entered for this profession, with a view to offering their services for war work. The Defence Department, foreseeing the great need there would be, on the return of the men, for operations in this and electrical treatment, have enlisted and put under a course of training at the Otago School of Massage seventy young women, who after the six months' University course, were drafted to the orthopædic hospitals at Christchurch and Trentham and some to Rotorua, while others remained at Dunedin to complete their training with the military patients at the hospital there under Captain White and Miss Knox Anderson. Besides these students, among the last class of whom there are seven returned military sisters, twenty or more of the sisters on service in England have gone through the course and are now returning.

The Defence Department also cabled for three specially trained masseuses to act as instructors under engagement for three years at the pay for charge sisters and their expenses out from England and back.

The Dominion should shortly be well provided with masseuses. The course for the military students, for whom all fees are paid, and who are also paid all living-expenses and a small weekly sum for pocket-money in consideration of two years' service after the war, is the same as that for the ordinary students, and they will be required to pass the same examinations. They will be eligible for admission to the Register of Masseurs as soon as the proposed Bill is passed by Parliament, and in the meantime will receive a certificate which will entitle them to registration.

The training of male students is practically at a standstill. There are very few applicants. An attempt was made by the military authorities to train orderlies for this work, but without much success, and it appears now to be recognized, even by those doctors who were most averse to masseuses treating male patients, that, like nursing, this is pre-eminently women's work.

H. Maclean.

HOSPITALS, CHARITABLE, AND DEPARTMENTAL EXPENDITURE.

The Secretary to the Inspector-General of Hospitals and Chief Health Officer.

The expenditure of the Department during the past year was as follows:—

	Expended, 1918–19. £
Permanent Appropriations—	
Subsidies under the Hospitals and Charitable Institutions Act ...	272,564
Departmental vote from the Public Works Fund	2,332
Departmental vote from the Consolidated Fund	123,420
Total	£389,316
Recoveries—	
Credits in reduction of votes	20,613
Miscellaneous revenue	6,120
Total	£26,733
Net expenditure	£371,583

Much of the recoveries shown under "Credits" in reduction of the vote is revenue pure and simple.

The Department has in the past been ranked to a great extent according to the size of its vote under its class on the Consolidated Fund, and the large expenditure and responsibility incidental thereto in connection with subsidies has been apt to be overlooked, appearing as it does modestly as a one-line item among the appropriations "Under Special Acts of the Legislature." Yet the Department's financial responsibility by no means ends here. In addition to the expenditure of the above-mentioned funds, it is responsible for ensuring the economic expenditure of hospital and charitable institutions, which now amounts to three-quarters of a million pounds annually, and shows every indication of immediately reaching the million mark.

Expenditure under the Hospitals and Charitable Institutions Act.

A further report on this matter will be submitted, together with tables and Income and Expenditure Account and balance-sheets of Boards as an appendix to this report. The same difficulty is being experienced as heretofore in obtaining the annual returns with anything like promptitude from Board officers; the Boards themselves are very curiously apathetic in the matter. This is equally the case with regard to Board's estimates of their requirements. It seems remarkable that members of Boards should be content months after the close of the financial year to proceed with the Board's business, including the passing of accounts for payment, without being aware either of the receipts and payments for the last financial year or the estimated requirements for the current year. It is safe to say that a business man would immediately after the close of the financial year require to know the financial position of his business. It should be possible to produce the figures in regard to the estimates, at all events, immediately after the 31st March, and in a report published by the Department as late in the year as August or September it should be possible to include such figures. Though the exact estimates of hospital and charitable-aid expenditure are not available, yet sufficient information has been forthcoming to enable the Department to arrive at a close approximation, with the result that it has been found necessary to place the sum of not less than £325,000 upon this year's estimate, as against £275,000 voted and £272,564 expended last year. In 1909–10 the appropriation for subsidies was £150,000. In 1919–20 £325,000 will be required, an increase of 217 per cent. in the ten years. The total expenditure of Boards and separate institutions for last year is not yet known, but for 1917–18 it was £688,593, as against £210,780 for 1907–8. This great increase is cause for serious reflection. In this connection attention must be again drawn to the neglect evinced by many Secretaries in the collection of patients' fees. In the appendices to the report of 1917–18, which owing to the regrettable neglect of some Secretaries in not sending in their returns has only just been published, is a table showing the fees received and the fees outstanding, which discloses a state of affairs which is a matter of the gravest concern. In that year the total fees receivable by Hospital Boards, including fees outstanding at the beginning of the year, was £564,978, whilst the fees outstanding at the end of the years were £318,443. The percentage of fees collected by the Boards was only 17·5 per cent., while as regards the Department's own institutions the percentage was 64 per cent. With the appointment of an Inspecting Accountant first-hand knowledge of the methods pursued will be available, and in view of the fact that it is proposed to introduce an amendment to the Act, giving subsidy on a sliding scale according to a Board's needs, it might be necessary, in cases where negligence on the part of the Board's financial administrators is discovered, for the Department to seriously consider whether it should not recommend the Minister to utilize the discretionary power he possesses to deduct from the subsidy payable such amount as is the direct result of the negligence of such officers. As the control of the Board's administration is in the hands of representatives of local authorities any extra expense caused by neglect in such administration should be borne entirely by the local authorities, and this would have the effect of stimulating their representatives to ensuring the proper activity on the part of their officers, and make it certain that the rate of subsidy is not increased owing to negligence in collecting other revenue. An alternative method which suggests itself, in view of the heavy burden on the Consolidated Fund, is whether the Department should not take steps to have the Board Secretaries made officers of the Department—that is to say, that the Department should appoint and pay such officer, and would then be in a position to insist upon its requirements as regards the necessary information being furnished and the requisite activity displayed in the collection of revenue. In all other respects such officer would be the servant of the Board and would take his instructions from the Chairman.

False economy has been practised by some of the smaller Boards in combining the positions of Secretary and Sanitary Inspector. In the latter capacity such officer is, or should be, seldom in the office and constantly in the field. In his capacity of Secretary, however, he should be at the hospital, where he should interview every patient on discharge. The amount of fees payable even to the smallest Boards is considerable, and the amount of bad debts that have to be written off would generally more than pay the cost of the Secretary's salary.

There is considerable diversity in the salaries paid to the Secretaries even of Boards with the same amount of "turn-over." Officers occupying such responsible administrative positions should in every instance be adequately paid, and then efficiency should be insisted upon. An underpaid officer is a discontented officer, a discontented officer is an apathetic officer, and from an apathetic officer good work never results.

The following serves as an instance of such apathy: An officer who absolutely neglected the Department's request for information and ignored departmental correspondence only roused himself from his apathy to apply for an advance on account of subsidy, as being doubtless a simpler method of "raising the wind" than collecting the long-overdue levies from the contributory local authorities, the means of obtaining funds by way of bank overdraft having been exhausted. It

must not, however, be supposed that such is an example of the typical Secretary, especially those of the large centres. Many Board Secretaries are both energetic and efficient officers in the highest degree, fully conversant with all the intricate details of hospital economics and the prevention of waste, and of such officers the Department is keenly appreciative.

Nor must it be supposed that members of Boards are necessarily neglectful of their functions. This is especially the case as regards the Chairmen, the majority of whom devote a very considerable amount of their time and energies to the affairs of the Boards, oftentimes to the detriment of their own affairs. It is not, however, necessary that members of Boards, or even the Chairmen, should take active steps in the detailed administration, but it is necessary that they, together with the Department, be satisfied that the administration is being carried out on sound lines and upon the policy decided upon. In this spirit there should be no cause for any resentment against the inspectorial activities of the Department, nor its insistence upon correct statistics of costs being furnished, as such information is not only for the protection of the Consolidated Fund, which, after all, is provided by the public, but for the protection of the ratepayers, whom members of the Board represent. It must be remembered that these ratepayers in their other capacity as taxpayers are contributing towards the subsidy paid by the Government, and their representatives should therefore as much as possible work in sympathy with the Department. The position and functions of members of the Boards is admirably set forth in an article in the current number of the *Modern Hospital* on the functions of hospital trustees, of which the following is an extract:—

"But if the Superintendent is responsible for administration and the staff for treatment, what is left for the trustees? The highly indispensable function of seeing that these and all other responsibilities are properly met. There used to be—and perhaps there still is in some quarters—a feeling prevalent in the medical and administrative staff that a Board of Trustees, except so far as it was necessary for the raising of money, was a concession to convention, which made itself an active nuisance in proportion as it took itself seriously. The best Board of Trustees was the one which approached the nearest to being a nonentity. A Superintendent who knew his business should not be called to account by a non-expert body like a Board of Trustees; no more should a competent medical staff.

"The tendency of the expert to resist and even to resent lay control is natural and perennial; it is justified wherever the layman presumes to pass judgment of technical method; it is not justified where the layman asks for an accounting on results. The expert, be he or she a cook, a chauffeur, a lawyer, a physician, or a nurse, is the servant of the lay public or some portion thereof, and as such is answerable for results. We may not be able to instruct our cooks how to make a pudding, our chauffeurs how to run an automobile, still less our lawyers how to handle our legal business and our physicians and nurses to handle our cases of illness. We are, however, justified in demanding of any of these experts that they continuously show us proof of their competence. It is good for them; it is good for any of us to know that we are thus continuously held to accountability—that our good work is appreciated and our bad condemned."

During the past year the Department has given further consideration to the question of subsidies, and the Minister instructed that an amendment of the Act should be drafted embodying a scale of subsidies in which half the net maintenance expenditure of Hospital Boards would be borne by the Government, or, in other words, an average subsidy of £1 for £1 is guaranteed no matter what the aggregate maintenance expenditure amounts to. The subsidy, however, to individual Boards would be based upon a sliding scale above and below such average according to the needs of the district—*i.e.*, a district whose hospital levy is above the average rate of levy in the pound on rateable capital value would receive over pound-for-pound subsidy, and the district whose rate of levy is under the average would receive less than £1 for £1, thus tending to equalize the burden on rates throughout the Dominion.

The Department recognizes that it cannot, as under the present scheme of subsidy, rely upon arbitrary figures as being determining factors as to whether a Board's administration is extravagant or economical, nor, indeed, in view of the foregoing can it rely upon a penalizing scale of subsidy for checking extravagance in expenditure. It recognizes that the subsidy must be given according to a Board's needs, and that it lies with the Department by close supervision and inspection to prevent negligence or extravagance. The Department is at present obtaining belated returns from Boards, which in many instances ensure no more than rough comparisons between institutions, and only show the main directions of increase in expenditure. The mere publication of such records, even if they were reliable and were compiled upon a consistent basis, is of no value by itself, and requires to be associated with regular and systematic inspection of the business administration of the Boards.

To this end applications were called for the position of Lay Inspector of Hospitals—*i.e.*, an Inspecting House Steward—who would be known as the Inspector of Supplies and Establishment, and this appointment was being considered when the influenza epidemic broke out. Nothing, however, could be done, and the whole matter was recently reconsidered, when it was decided that there was need for two appointments—viz., that of an Inspecting Accountant to thoroughly investigate and report upon more particularly the office side of Boards' administration, and an Inspector, to report upon the domestic and establishment side of the institutions themselves.

The appointment of a Purchasing Officer was also considered to assist Boards in obtaining their supplies to the best advantage.

The Department has already taken steps in regard to the appointment of the Inspecting Accountant and the Purchasing Officer. It will be the duty of the first-named officer to promote efficient office methods, uniformity in the preparation of returns, and promptness in the furnish-

ing thereof. He will watch the revenue, and ensure that it is being collected, and his costing returns will accurately indicate where there is waste in use or lack of acumen in purchasing supplies.

The duties of the Inspector of Supplies and Establishment would be very important and require varied and detailed knowledge of institutional management. He would report and advise upon the methods of purchasing, storage and use of all articles, the prevention of waste, and the economical utilization of waste products. This officer would require to possess considerable tact if friction is to be avoided with Matrons and other professional officers. As his duties, however, would lie within the House Steward's Department, such a contingency should be avoidable. The question of filling this important position is at present receiving the consideration of the Inspector-General. The efficiency of the House Steward is one of the most important factors in the economical administrations of the hospital, and upon such depends to a very large extent the expenditure of the institution. It is necessary that the House Steward should be a thoroughly trained and experienced officer, and that his work and results shall be closely watched and inspected by an Inspecting Officer who has had actual practical experience in hospital administration and economics. Of the important administrative officers in the institution the House Steward is the only one from whom is demanded no certificate of training and competency. Medical Superintendents, Matrons, and nurses have to be proved by a certified period of training—not so the House Steward. Bursaries and scholarships are granted to medical students and others, and elaborate arrangements are made and facilities offered for the training of bacteriologists. The question suggests itself as to whether at one of the largest hospitals in whose administration the House Steward's Department is complete and scientific there should not be established a course of training which would enable a sufficient number of competent House Stewards to be available to fill institutional needs. There is a growing tendency to appoint House Stewards among the various institutions—appointments that where previously confined to the hospitals in the four chief centres. During the past year two hospitals have made a departure in this direction.

Certain difficulties present themselves in connection with the purchasing of hospital supplies. The Department can hardly insist upon Boards agreeing to its purchasing their supplies without giving some close indication of to what extent it proposes to save Boards' expenditure or purchase to better advantage than they themselves are doing. If the Department finds that it can actually quote certain lines at definite prices which are lower than those at present paid by the Board, then the difficulty to a great extent disappears, but under present conditions, when such buying is done from hand to mouth, and prices are so unsettled, the problem is by no means simple. The Military Supplies Branch of the Defence Department has been most helpful to this Department and has promised assistance in this respect. The Department has taken steps in regard to the attachment to this office of an officer experienced in the purchasing of supplies, whose function it will be to devote his whole attention to the matter, and it is hoped that good results will follow this appointment.

The Department has already made one venture and purchased lint, cotton-wool, and gauze to the extent of £1,750, delivering the same direct from the manufacturers to the institutions at a time when the same would have been practically unobtainable locally in the same quantities and was realizing much higher prices. It is considered that by this transaction alone the Department saved such Boards as availed themselves of its action about £500, and, moreover, prevented a dearth in a commodity that would otherwise have arisen.

The officers above referred to would work in close collaboration in the matter of institutional supplies—*e.g.*, the Inspecting Accountant's duty would be to report the quantity and price of, say, a certain article purchased by a Board. The Inspector of Supplies might report with a view to standardizing supplies, that another material would be just as suitable, or that a saving could be effected by a difference in size, &c. The Puchasing Officer would point out that the material could have been purchased at a lower price, would show the saving that would have resulted, and would be prepared, if desired, to place orders for the Boards accordingly.

The Boards of the four chief centres are in a much better position than the smaller Boards in the mater of purchasing their supplies, and in some directions have purchased to advantage. The Secretary of the North Canterbury Board recently reported having made arrangements with a Home firm which would result in still further economy. The smaller Boards, however, cannot, much as they may desire to do so, make such good arrangements, and it is only by co-operation, the desire for which has been expressed by more than one Board, that anything can be done to assist them.

In this connection appreciation must be expressed of the Director of Equipment and Ordnance and the Officer in Charge of Medical Stores of the Defence Department for their readiness and willingness at all times to allow their stocks to be drawn upon.

Influenza Epidemic Expenditure.

I have already dealt fully with the financial administration of the epidemic in the *Journal of Public Health* this year (pages 6 to 119), under the heading of "Financing the Epidemic" and "The Economical Administration of Epidemic Expenditure," there is no need, therefore, to go into this matter at length. An analysis has been made of the expenditure both as regards the hospital districts in which the money has been spent and also under the various headings, such as medical

services, motor-hire, drugs, &c., and is attached hereto. Even at this date occasional belated claims come to hand, but the attached table gives a close approximation of the expenditure. Claims paid to date amount to over £190,000, and there are a few reimbursing vouchers to Hospital Boards in transit which will bring the expenditure up to over £200,000. Further credits resulting from equipment have yet to be brought to account, and it is anticipated that the total cost will thus be reduced to approximately £200,000.

Most accounts of over £40 in amount were submitted to and paid by the Department, thus lessening the pressure on Boards' finances pending reimbursing vouchers being passed. It was customary, however, for wages, and also for small accounts, to be paid direct by Hospital Boards and reimbursement subsequently obtained from the Department. The volume of work entailed by these claims necessitated the appointment of a special temporary branch under the supervision of Mr. Crichton Smith, of whose energy and initiative I cannot speak too highly.

Discounts and Reductions in Claims.—Claims, which numbered several thousands, required in every instance careful scrutiny. It was found in a large number of instances that no steps had been taken in the direction of obtaining discounts or rebates on the claims made. In few instances was it found that the claims could be passed without question, and it was found desirable that the officer in charge of the epidemic accounts or some other officer should visit, as far as possible, every district and investigate the expenditure upon the spot.

Despite the pressure of work arrangements were made by which every district has been visited for this purpose, with the exception of a small portion of the Auckland Health District and a portion of the South Island. In this connection the thanks of the Department must be expressed towards such firms as gave generous discount when asked to do so. The Department's officer was met in most instances in a most public-spirited manner, reductions amounting in many cases to 10 or 15 per cent., and in one or two cases as high as 20 per cent., having been obtained. There were, of course, a few isolated instances where claimants showed a mean spirit and, in the face of the calamity and despite the fine spirit showed by voluntary workers, insisted upon extracting from the Government every penny that could be legally claimed.

In many instances accounts, though certified to as fair and reasonable and as such could have been presented to audit, did not bear close investigation upon the spot. Numerous instances could be quoted, but the following will suffice as examples: In one district claims for wages were reduced from £185 to £50. In another claims under the same heading fell from £315 to £205 upon a visit from our officer. A picture-theatre was taken as a temporary hospital, and claims in consequence were lodged for compensation and repairs amounting to £180. This was reduced to £90 as a result of a personal visit from our representative. A chemist's account for £250 was settled at £200. In all, discounts and reductions amounting to over £9,000 have been obtained after the accounts were received by the Department.

Hospital Equipment. From every account passed was extracted a full list of all equipment under the headings of "Drapery," "Bedding," "Hardware," "Crockery," "Fittings," &c., and these were assembled on stock-sheets, which numbered some hundreds of pages. Such action has been conducive to a further saving by the recovery of large quantities of material which had been overlooked in the various temporary hospitals; it also acted as an inventory and a very necessary check upon such equipment.

Boards having been informed that they should carry full stocks of equipment so as to be prepared for the eventuality of a future epidemic were given an opportunity of acquiring such of the epidemic equipment as they required, and steps have recently been taken to dispose of the remainder. Difficulties in storage, carelessness in handling, and lack of proper custody show that there would be loss or deterioration, and made it desirable that all the equipment should be disposed of without further delay. Systematic sales have been effected to Hospital Boards, the Department's own institutions have taken considerable quantities, and the newly erected quarantine-stations at Somes Island and Motuihi have been equipped with some thousand pounds' worth of the surplus equipment. The remainder has been disposed of to the public, and in many cases more than cost price has been obtained therefor.

Relief to Epidemic Widows and Widowers with Children.—Full particulars regarding the relief given to widows and widowers with children are published in the August number of the *Journal of Public Health*. The total number of widows receiving relief is 828; the number of children dependent thereon, 2,323. The total number of widowers receiving relief is 89, and the total number of children dependent thereon, 366. The total annual commitment of the Department in regard to such relief is £75,374. Detailed table is attached.

Children orphaned by reason of the epidemic are entirely under the administration of the Education Department, and are not included in the above.

Relief to adult Maoris is administered by the Hospital Boards on lines decided upon by the Native Department. In most cases goods being supplied rather than cash. Such expenditure is refunded by this Department, and is not included in the commitment above mentioned.

Conclusion.

In conclusion, I have to express my appreciation of the excellent work done by the permanent officers of the staff of this section of the Department. It would be invidious and, indeed, contrary to the recognized procedure to mention any one name, but it suffices to say that without a well-trained and efficient staff with expert knowledge of their work no good results could be obtained.

E. Killick, Secretary.

INFLUENZA WIDOWS AND WIDOWERS. RELIEF GRANTED BY HOSPITAL BOARDS THERETO.

Name of Board.	Number of Widows receiving Relief.	Number of Children dependent thereon.	Number of Widowers receiving Relief.	Number of Children dependent thereon.	Total Annual Commitment.
					£ s. d.
Bay of Islands ..	7	23	2	10	962 0 0
Kaipara ..	3	10	..	..	218 8 0
Whangarei ..	10	41	2	9	1,314 6 0
Auckland ..	168	410	14	62	12,265 10 0
Waikato	40	121	1	7	3,193 17 8
Thames	15	32	3	9	1,200 0 0
Waihi	6	30	3	11	1,077 0 0
Coromandel ..	5	9	..	..	382 4 0
Tauranga ..	1	1	..	..	27 6 0
Bay of Plenty ..	5	9	..	..	382 4 0
Taumarunui ..	9	23	3	10	1,073 16 0
Waiapu	..	..	..	..	..
Cook	4	8	..	..	266 10 0
Wairoa	1	3	..	..	81 18 0
Hawke's Bay ..	33	87	..	..	2,918 1 0
Waipawa	13	33	1	3	830 14 1
Taranaki	19	56	3	6	2,910 14 0
Stratford	5	16	..	..	591 10 0
Hawera	16	41	1	4	1,509 6 0
Patea	3	6	1	3	468 0 0
Wanganui ..	38	97	4	15	3,489 6 0
Palmerston North ..	40	131	10	41	3,791 12 0
Wellington ..	114	306	4	11	12,370 16 0
Wairarapa ..	26	79	1	2	3,612 14 0
Wairau	1	11	..	..	468 0 0
Picton	..	..	..	..	..
Nelson	8	32	..	..	951 12 0
Westland ..	8	15	1	6	945 0 0
Buller	2	12	..	..	327 12 0
Inangahua ..	3	15	1	7	409 10 0
Grey	11	28	..	..	815 2 0
North Canterbury ..	87	246	6	26	6,698 16 0
Ashburton ..	7	23	1	4	684 0 0
South Canterbury ..	7	24	1	3	709 12 0
Waitaki	17	60	2	16	1,273 0 0
Otago	60	173	10	35	4,318 12 0
Vincent	2	3	..	..	284 18 0
Maniototo ..	..	..	..	..	..
Southland ..	34	111	13	58	2,719 10 0
Wallace and Fiord ..	2	7	..	..	149 2 0
Mercury Bay ..	..	..	1	8	65 0 0
Totals ..	828	2,323	89	366	75,374 14 9

NOTE.—Table showing influenza-epidemic expenditure appears on page 22.

REPORT OF THE ACTING GOVERNMENT BACTERIOLOGIST FOR THE YEAR ENDED 31ST MARCH, 1919.

The GOVERNMENT BACTERIOLOGIST, Wellington, to the INSPECTOR-GENERAL OF HOSPITALS and CHIEF HEALTH OFFICER.

SIR,—

During the absence of Major Hurley on leave from the 29th January, 1919, I have been acting as Government Bacteriologist.

The number of routine examinations carried out during the year on behalf of the Public Health and Defence Departments, the Wellington Hospital, and medical practitioners totalled 24,628, made up as shown in the appended tabular statements. Of this total, 20,126 were carried out for the Public Health and Defence Departments, chiefly the latter. The termination of the war, with the consequent closing of the various camps, has resulted in the reduction of the number of specimens received for examination, and it is expected that the figures for next year will show a reduction on those of the year under review.

During the year, owing to the prevalence of diphtheria in Southland, the services of Mr. Dore and Mr. Pierard were made available from April to August to the Southland Hospital Board.

The efficient manner in which the staff carried out the greatly increased amount of work, entailing considerable overtime, is deserving of great credit.

The tables given do not include the large quantities of T.A.B. vaccine prepared for the Defence Department, the mixed-influenza vaccine for the Health Department, nor the calf-lymph prepared at the vaccine-station. Particulars concerning these are given below.

T.A.B. Vaccine.—This was prepared in two dilutions, the second dose double the strength of the first. The first or primary dose contained B. typhosus, 500 millions; B. paratyphosus A, 250 millions; B. paratyphosus B, 250 millions. Of each dilution 15,120 doses were prepared for the Defence Department, and in addition a stock of 1,000 of each of first and second doses was always kept in hand available for immediate use when required.

Mixed Influenza Vaccine.—In accordance with instructions received from the Department in February of this year, supplies of this vaccine were prepared and issued to all hospitals in the North Island. In all 25,000 each of both first- and second-class doses were prepared, and 10,900 issued. In anticipation of a demand for this vaccine, the quantity available for immediate issue is kept up to 10,000 doses. The organisms of which the vaccine is composed, and the numbers of each, are similar to those in the mixed-catarrhal vaccine used with considerable success in the New Zealand Expeditionary Force in England and France during the influenza epidemic. The work of preparing these vaccines has been carried out by Mr. P. L. Hickes.

A short account of the bacteriological findings during the epidemic of October–December, 1918, is appended.

It is becoming more and more an important factor in the life of the community and the time is fast approaching when a division into two Departments (Bacteriological and Pathological) will be necessary, if the laboratory is to give the assistance in the investigation of pathological conditions which the community has a right to expect.

The work carried out for the Public Health Department is expected to increase greatly in the near future, especially in the investigation of cases of venereal disease. The opening of clinics where such cases can obtain treatment will react on the laboratory and increase the work of an already fully occupied staff.

Table showing Results of Examinations of Specimens received from 1st April, 1918, to 31st March, 1919.

Material.	Object of Examination.	Result.		Total.
		Positive.	Negative.	
Morbid exudates (includes purulent discharges; empyema; pleuritic fluids; pyorrhœa; trench-mouth; synovial fluids; ascitic fluids)	Staphylococcus	86	..	86
	Streptococcus	41	..	41
	Tubercle bacillus	11	39	50
	S. vincenti / B. fusiformis	140	72	212
	Gonococcus	63	161	224
	Spironema pallidum (Schaudinn)	4	4	8
	Pneumococcus	44	..	44
	B. coli	3	..	3
	Ducrey's bacillus	..	3	3
	Actinomyces	1	4	5
	B. proteus	2	..	2
	B. xerosis	12	..	12
	Abel's bacillus	2	..	2
	B. enteritidis	1	..	1
	B. of leprosy	1	..	1
	B. Welchii	..	1	1
	Oidium albicans	2	..	2
	Negative examinations	..	118	118
	Total	..	..	815
Sputum	Tubercle bacillus	218	764	982
	Pneumococcus	57	..	57
	B. influenzæ	59	8	67
	Hydatids	5	22	27
	Total	..	..	1,133
Throat-swabs	B. diphtheriæ	1,608	3,171	4,779
	Meningococcus	..	..	15,784
	Organisms of Vincent's angina	20	21	41
	Total	..	..	20,604

Table showing Results of Examinations of Specimens received from 1st April, 1918, to 31st March, 1919—continued.

Material.	Object of Examination.	Result.		Total.
		Positive.	Negative.	
Blood	Cultures	2	3	5
	Counts	..	..	153
	Widal reaction	132	609	741
	Wasserman reaction	..	..	407
	Malaria	8	11	19
	Filaria	..	..	1
	Total	..	..	1,326
Cerebro-spinal fluid	Meningococcus	39	37	76
	B. influenzæ	2	1	3
	Pneumococcus	4	..	4
	Tubercle bacillus	1	10	11
	Streptococcus	2	..	2
	Total	..	..	96
Stomach contents	Chemical	..	..	21
	Microscopical	..	..	2
	Total	..	..	23
Skin-parasites	..	3	6	9
Inoculated culture tubes ..	For examination	..	..	138
Urine	Microscopical	..	..	304
	Bacteriological	..	..	205
	Chemical	..	..	70
	Tubercle bacillus	16	82	98
	Total	..	..	677
Fæces	Parasites	6	21	27
	B. typhosus	5	32	37
	B. enteritidis	4	..	4
	B. paratyphosus	2	..	2
	Tubercle bacillus	2	9	11
	Chemical	..	..	11
	Total	..	..	92
Autogenous vaccines ..	(For particulars see separate table)	..	..	410
Tissues	For pathological examination ..	..	..	243
Disinfectants	For carbolic coefficient ..	..	..	5
Water	..	..	..	1
Unclassified	..	..	..	37
Animal inoculations	Guinea-pigs	..	..	9
	Rabbits	..	..	5
	Mice	..	..	5
	Total	..	..	19
	Total for year ..	..	..	24,628

Autogenous Vaccines prepared.

Organisms.	Number of Vaccines prepared.	Organisms.	Number of Vaccines prepared.
Abel's bacillus	4	B. paratyphosus A	1
Acne bacillus	3	B. paratyphosus B	1
M. catarrhalis	36	B. typhosus	2
B. cleacæ	2	Pneumococcus	26
B. coli	43	B. proteus	12
B. coryzæ	4	B. pyocyaneus	1
B. diphtheriæ	1	Staphylococcus albus	27
Diphtheroid bacilli	37	Staphylococcus aureus	92
B. enteritidis	5	Streptococcus	88
M. gonorrhœæ	4	Streptothrix	1
B. influenzæ	7	B. xerosis	4
Koch Weeks bacillus	1		
Diplococcus intracellularis meningitidis	8	Total	410

REPORT ON WORK DONE AT THE VACCINE-STATION.

Lymph for vaccination against smallpox is prepared at the vaccine-station in Museum Street for the whole of the Dominion, and also for some of the Pacific islands.

The lymph obtained from the inoculated calves is mixed with the necessary amount of glycerine and stored in bulk in an ice-chest for three months prior to issue. Bacteriological examinations of the lymph, immediately after collection, are carried out to ascertain the varieties and numbers of micro-organisms present. A second examination is made before the lymph is put up in tubes, and any lymph not reaching the required bacteriological standard is rejected. Only one batch of lymph (B. 1 of January, 1919) had to be rejected owing to the presence of a spore-bearing baccillus, which, however, was not pathologenic to guinea-pigs.

With each consignment of lymph issued a report form was enclosed, but, unfortunately, very few of these forms have been returned. It is only by obtaining reports of the efficacy or otherwise of the lymph that its value as a prophylactic against smallpox can be ascertained, and it is to be regretted that more information on this important point is not available.

The total amount of lymph prepared during the year, excluding that reserved for "seed," was 32,816 tubes, each containing sufficient for the vaccination of two individuals.

The conditions prevailing during the year were abnormal in that, owing to the demands of the War Departments of Great Britain and the United States, the energies of manufacturers of biological products were devoted to supplying the wants of these Departments. As we rely on these countries for our supplies of serum it was extremely difficult to keep our stocks up to date. The position became acute towards the end of 1918, and it was necessary to use stocks slightly out of date. The expiry date of serum is the date beyond which full potency is not guaranteed, but as deterioration under suitable conditions is gradual it can be compensated for by the use of somewhat larger doses.

Under present conditions we must keep supplies sufficient to satisfy the reqirements of any hospital or private practitioner who desires sera or vaccines. But as some of the larger hospitals order their own supplies independently, and only draw on us when their stocks are exhausted, there is a possibility of a considerable waste of public money. This would be obviated if all orders for sera passed through the same channel, the Department acting as buyer and distributor.

If such an arrangement were made the percentage added to the net cost to prevent a loss resulting from dealing in these products could be considerably less than that added at present.

T. R. RITCHIE, M.B., Ch.B.,
Acting Government Bacteriologist.

Analysis showing the Expenditure borne by the Government in connection with the Influenza Epidemic.

Hospital District.	Medicine (including Thermometers).	Liquor.	Temporary Hospitals.					Oranges and Lemons.	Medical Men.	Funerals.	Motor Hire, Repairs, and Benzine.	Printing and Stationery.	Travelling-expenses.	Advertising.	Board and Residence.	Sundry.	Total.
			Disinfectants.	Inhalation Chambers.	Equipment.	Fuel, Light, and Provisions.	Wages.										
	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Bay of Islands ..	66	10	..	..	317	459	170	..	583	..	316	..	15	17	6	8	1,967
Kaipara	98	36	2	8	281	363	810	4	41	230	238	..	..	57	15	32	2,215
Whangarei (*a*) ..	..	7	3	..	..	9	83	28	..	..	37	..	26	12	5	4	214
Auckland (*b*) ..	4,927	456	535	1,272	16,580	3,585	3,847	1,765	510	2,014	4,950	128	799	497	528	412	42,805
Waikato (*c*)	1,297	354	25	39	3,304	1,142	1,638	151	506	153	1,139	38	16	70	442	193	10,507
Thames	80	25	14	13	269	209	218	23	21	178	217	..	14	33	20	68	1,402
Waihi	28	..	17	..	65	92	97	3	111	..	591	..	10	7	3	..	1,024
Tauranga	8	..	..	..	6	34	126	20	129	..	58	..	..	7	..	..	388
Coromandel	..	..	1	..	3	44	16	..	100	..	33	..	..	10	..	9	216
Bay of Plenty ..	100	66	12	..	1,378	432	507	16	257	283	790	4	108	45	121	10	4,129
Taumarunui	8	19	20	..	399	209	128	1	98	..	85	..	1	8	..	..	976
Waiapu	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cook	15	24	11	13	214	52	51	..	312	..	254	..	..	62	46	12	1,066
Wairoa	..	161	28	..	1,404	429	321	8	270	..	380	..	23	22	157	14	3,217
Hawke's Bay (*d*) ..	488	43	27	126	6,232	1,420	2,096	42	245	183	1,770	79	37	51	25	159	13,023
Waipawa	71	8	..	127	343	88	497	..	183	..	107	2	29	38	9	6	1,508
Taranaki	699	64	20	99	2,415	328	927	..	150	22	838	..	30	56	50	43	5,741
Stratford	245	40	35	55	772	190	275	27	16	..	888	6	44	34	27	73	2,727
Hawera (*e*)	..	29	..	27	884	107	274	145	10	..	211	..	22	100	95	18	1,922
Patea	..	2	..	..	19	4	356	2	51	51	129	..	..	17	..	..	631
Wanganui	502	51	310	14	5,016	750	1,205	134	250	94	713	36	25	589	503	86	10,278
Palmerston North ..	258	66	8	57	945	351	299	139	576	41	226	45	8	107	176	97	3,399
Wellington	305	247	1,313	511	1,216	1,418	3,118	774	5,272	1,567	1,576	48	142	1,212	41	645	19,405
Wairarapa (*f*) ..	631	177	25	..	1,406	1,104	797	3	394	81	892	10	..	394	68	24	6,006
Total North Island ..	9,826	1,885	2,406	2,361	43,468	12,819	17,856	3,285	10,085	4,897	16,438	396	1,349	3,445	2,337	1,913	134,766
Wairau	133	3	3	88	867	61	155	..	289	12	198	..	..	35	3	100	1,947
Picton	..	..	..	2	..	..	24	..	..	..	6	..	..	5	..	1	38
Nelson	15	54	150	7	94	61	134	..	214	..	18	1	3	35	..	6	792
Westland	50	..	11	36	280	61	210	..	48	25	143	..	9	45	..	7	925
Buller	21	66	50	224	189	85	254	9	16	..	112	5	28	123	82	21	1,285
Inangahua	2	..	..	..	..	..	34	..	100	..	56	..	..	34	..	4	230
Grey	..	..	5	..	395	62	199	..	66	44	72	..	7	49	5	..	904
North Canterbury ..	767	227	352	505	7,027	1,891	3,945	803	1,697	46	3,224	237	150	838	181	164	22,054
Ashburton	40	14	6	..	270	29	70	..	186	..	35	..	40	14	..	19	723
South Canterbury (*g*) ..	78	34	14	80	763	276	665	..	316	..	408	3	55	97	36	32	2,857
Waitaki	116	5	17	29	283	67	154	2	7	28	112	..	13	78	4	12	927
Otago	143	175	288	117	2,925	655	865	122	1,584	44	977	54	191	482	50	104	8,776
Vincent	13	12	..	4	28	2	115	4	..	7	49	3	6	2	26	2	273
Maniototo	..	..	..	..	1	1	6	..	..	..	..	..	..	8	..	..	16
Southland	313	38	39	10	1,454	345	395	3	423	35	454	24	35	233	13	11	3,825
Wallace and Fiord ..	117	28	2	13	301	235	1,191	..	122	30	228	22	1	8	6	17	2,321
Total South Island ..	1,808	656	937	1,115	14,877	3,831	8,416	943	5,068	271	6,092	349	538	2,086	406	500	47 893
Total of the Dominion	11,634	2,541	3,343	3,476	58,345	16,650	26,272	4,228	15,153	5,168	22,530	745	1,887	5,531	2,743	2,413	182,659

(*a*) £900 further paid since table was compiled. (*b*) £1,494 further paid. (*c*) £275 motor hire. (*d*) £2,466. (*e*) £2,374. (*f*) £288. (*g*) £92, temporary hospitals. Except where stated these amounts will require analysing under the various headings and adding thereto

APPENDICES.

APPENDIX A.

INFLUENZA PANDEMIC.—REPORT ON THE EPIDEMIC IN NEW ZEALAND. BY DR. R. H. MAKGILL, DISTRICT HEALTH OFFICER, AUCKLAND.

THE term "influenza" is a comprehensive one and has in the past been loosely applied to any catarrhal condition accompanied by certain general symptoms, such as raised temperature and pains in the limbs, if because of its infective nature it assumed local or general epidemic features. In New Zealand, as in all other countries, each year influenza has been reported generally in the winter months, and a few deaths are attributed to this cause—generally from secondary complications such as pneumonia. From time to time a catarrhal epidemic of more than average severity of symptoms and wideness of incidence arises constituting a pandemic of world-wide significance. Such pandemics so impress themselves on the public mind that they are labelled by some special name, as, for example, "La Grippe" in 1890. In Britain, following on the pandemic of 1890–91, influenza has been manifested each year, with special epidemics in 1895 and in 1900. The pandemic of 1890–91 affected New Zealand markedly, but the British epidemics of 1895 and 1900 were scarcely noticeable here. Prior to November, 1918, influenza was not a notifiable disease, therefore the records for previous years are very unreliable. We learn, however, from the Registrar-General's returns that a certain number of deaths, varying from forty or fifty to over two hundred each year, are attributed to influenza. Thus during the five years prior to 1918 the following deaths from influenza are recorded :—

Table 1.

1913	56
1914	63
1915	110
1916	73
1917	38

It is probable also that had other deaths, due to such complications as pneumonia following on influenza, been recorded as from the primary cause these figures would have been increased.

We find in the above years the following deaths from pneumonia, broncho-pneumonia, and bronchitis: 1913, 771; 1914, 722; 1915, 716; 1916, 687; 1917, 608.

The records of the military camps for the years 1915 to 1918 also indicate that a considerable amount of influenza prevails annually in the Dominion. The following figures are available from the camp records: 1915—Influenza prevalent till middle of July, up to which time 1,814 cases were notified. 1916—Epidemic of influenza was severe, especially in July and August. Total cases in the camp during the year were 5,527; among these, nine deaths occurred due to complications. 1917—Influenza was very much less this year, due probably to the use of the inhalation treatment and segregation of recruits. In all 1,156 cases were dealt with, among whom several cases of pneumonia occurred, none of which were fatal.

INFLUENZA IN 1918.

In common with the rest of the civilized world New Zealand suffered very severely from the pandemic of influenza in 1918, and as in other countries it showed itself in two distinct waves, the first of which reached its maximum about August or September, and the second developing about the first two weeks of November. The mortality due to the first wave, though abnormal for New Zealand, was not alarming; but the virulence of the second wave was far in excess of anything which has hitherto been experienced with influenza. A fact of the greatest interest to the epidemiologist is that the same division into first and second waves with undue morbidity of the second wave was experienced all over the world, and that the greatest intensity of the second wave was almost synchronous in countries so widely separated as Britain and New Zealand. The following is a brief summary of the position :—

In Britain.

As has been pointed out by Sir Arthur Newsholme, when President of the Local Government Board, the influenza epidemic in Britain in 1918 showed features never before experienced with the disease. That is to say, there was a primary wave with a peak in July—the first time on record that influenza was most prevalent in this month—and a secondary wave with its peak within sixteen weeks of the first. Never before has there been so brief a period recorded between waves.

The first wave seems to have begun in May, but during that month and June there was no serious mortality. Thus in the *British Medical Journal* of the 13th July we find the comment that "few cases have proved fatal." In July, however, it became more virulent, and the mortality towards the end of July was high, though not abnormally so. During August and September the epidemic declined, but about the middle of October a sudden increase of mortality was found, which marked the beginning of the second wave. This wave was marked by excessive mortality, chiefly from pneumonic complications, and had its peak during the week ending 9th November. The epidemic rapidly declined thereafter and was over in a few weeks. It was then of a very explosive character and of unexampled severity, causing in Britain a very high proportion of deaths. In February and March of 1919 there was another severe recrudescence in the form of a third wave. These facts briefly state the general position in Britain, but there were some localized outbreaks prior to the general October wave, which showed a high mortality. These outbreaks appear to

have occurred at ports playing the largest part in dealing with overseas shipping Thus at Glasgow the pneumonic type of epidemic appeared about 21st September, and similarly at Portsmouth cases showing a specially severe infection were reported about this time. The outbreak of fatal pneumonia on the transport "Tahiti" and other ships of the same convoy began on 28th August, showing that the virulent type of infection was early prevalent among shipping.

Europe.

Although the pandemic of 1918 was known as "Spanish influenza" Spain was not the first country in which the epidemic appeared. Probably the name "Spanish" was attached because this country was one of the first to show influenza widely among the civil population; but prior to this it had developed among the armies of the western front, probably first among the German soldiers in March and April. In the latter month it was epidemic among the French, Italian, and British troops. This first wave was not specially severe, and comparatively few deaths occurred, but all observers agree that there was a tendency to increased severity as the epidemic progressed. It varied somewhat in different countries in Europe, for in Italy by July influenza had practically disappeared from among the troops, while in Switzerland at the same time it was causing a number of deaths both in the army and among the civil population. In the latter country it waned during August and September, and then burst out again more violently than before. In September generally the epidemic began to show a tendency to increase, and by the end of that month a secondary wave of great virulence had developed in Paris, Spain, and Portugal. In October it reached Italy, Greece, Denmark, Holland, and Sweden. In Greece it was at its highest in the first weeks of November. In Switzerland in October.

The explosive nature of this outbreak is shown by the following figures relating to the British Expeditionary Forces in France: September—Twenty-four deaths from pneumonia and influenza. October—1,465 deaths from pneumonia and influenza among 27,596 admissions to hospital for these diseases. The date of this recrudescence in the Army in France is given as the 8th October.

America.

In the early part of 1918 there appears to have been a widespread epidemic of influenza throughout the States, though not of a severe type, and doubtless this constituted the primary wave. It was present on the Californian coast in April, and in July was prevalent in the eastern States. The American authorities date the secondary epidemic from the first two weeks in September, when influenza began to show itself in localized outbreaks in the military camps in Massachusetts, but was at first only mild in character. From here it spread westward, and was fairly universal throughout the States by the last week in September, but yet not of an alarming nature, since the official bulletins at that time adopt a warning tone as regards the possibility of pneumonic complications "in the coming winter months."

The first indications that the epidemic was already showing unusual features were noticed in the first week in October, when Health officials all over the States were directed to send daily bulletins as to the condition in their districts. About this time the pneumonic features appear to have become prominent in the eastern States.

In the western States the appearance of the pneumonic complication was considerably later. In San Francisco, for example, the epidemic began to appear on the 26th September, but it was not till the 21st October that the pneumonic type of the disease was reported. The crest of the wave was reached on the 2nd November, and then it declined rapidly, and towards the end of November disappeared. The following figures represent the dates of the peak of the second wave in different towns in America: Boston, 5th October; Washington, 19th October; New York, 26th October; San Francisco, 2nd November. The spread from Boston is here apparent, as also the delay before the wave reached the west coast.

The average date for the wave peak for the twelve chief cities in the States was the 26th October. The wave lasted at each centre from eight to ten weeks.

Canada.

In Canada influenza spread from east to west in the first two weeks of October, beginning apparently in Quebec about the 28th September. The first notification from British Columbia appears to have been made during the week ending the 12th October, but here the pneumonic complications were manifest from the first. In Ontario the wave peak was in October.

South Africa.

During September the South African States were visited by an epidemic of influenza which, though very widespread, was not productive of a high mortality. Even so far on as the 27th September the visit of N.Z. troopships at Durban and Cape Town did not result in infections of more than average severity appearing on board these boats, though no special preventive measures to exclude contact with infection were taken. The secondary wave seems to have developed with explosive suddenness in the first week in October in Cape Town, and about the 12th October in Natal.

The Native population, as might be expected, were the first to show the severity of the disease, and suffered most heavily throughout, their death-rate being treble that of the Europeans.

Australia.

Influenza of non-virulent type was fairly prevalent throughout Australia from August onwards. This we may regard as the primary influenzal wave seen in other countries. It was accompanied by a heightened death-rate, but not abnormally high. It is of great interest to note that during 1918 the definite secondary wave did not develop in Australia, and it was not till well on in January, 1919, that cases of the severe pneumonic type began to be frequent, Mel-

bourne, apparently, being the first town to show such infection. Since then this type of disease has developed throughout the Commonwealth, and has now continued in epidemic form for some months. Australia differs wholly from other countries, in that the secondary wave has been delayed and has not shown that explosive character so marked elsewhere.

Asia.

In India the primary influenza wave began in Bombay in June, and by the end of July had spread over the country, but this epidemic was not accompanied by a high mortality. In November, however, the secondary wave seems to have appeared and caused a great loss of life. It was also prevalent in China about this time.

South America.

In Brazil, Peru, and Venezuela an epidemic of influenza with high mortality was present during the last week of October and the early parts of November. No information as to the primary wave has been obtained.

New Zealand.

Since influenza was not a notifiable disease prior to November, 1918, the records of the epidemic during that year must be incomplete. We have, however, two sources of definite information—(*a*) The medical reports of the military training-camps; (*b*) the Registrar-General's return of deaths.

Statistics from Military Camps.—The following table represents the admission of influenza cases to hospital in the larger training-camps: —

Table II.

Month.	Cases.	Deaths.
January	22	—
February	30	—
March	16	—
April	13	—
May	32	—
June	16	—
July	145	—
August	571	2
September	1,216	—
October	1,116	2
November	4,369	280
December	15	
Totals	7,561	284

This record of cases does not include those treated outside the camp hospitals.

We may take this return as a fair indication of the incidence of influenza throughout New Zealand. The primary wave began in July—about two months later than that of Great Britain—and reached its crest in September, waning slightly in October. The second wave burst out with explosive violence and great mortality in November. Up to the end of October 3,177 cases had occurred, with four deaths. During November and December 4,348 cases, with 280 deaths, were recorded. The crest of the second wave is shown to be on the 9th November from the following figures, representing the daily admissions into hospital at the two largest camps:—

Table III.

Date.	Featherston.	Trentham.	Total.
October 28	12	3	15
,, 29	10	7	17
,, 30	14	7	21
,, 31	10	2	12
November 1	38	5	43
,, 2	48	7	55
,, 3	69	4	73
,, 4	149	29	178
,, 5	149	61	210
,, 6	399	137	536
,, 7	422	102	524
,, 8	375	150	525
,, 9	348	221	569
,, 10	261	294	555
,, 11	278	209	487
,, 12	149	135	284
,, 13	95	94	189
,, 14	99	62	161
,, 15	104	50	154
,, 16	49	37	86
,, 17	44	19	63
,, 18	41	17	58

The second wave in the camps may be said to have begun on the 1st November, and, as it was over by the 18th, the extremely explosive character is well illustrated.

REGISTRAR-GENERAL'S RETURNS OF DEATHS.

In Table V are shown the deaths from all catarrhal diseases, including influenza, pneumonia, bronchitis, and cerebro-spinal fever, which is now known to be intimately dependent on catarrhal outbreaks. For comparative purposes the returns for the concluding five months of 1917 are also given.

Table V.—Deaths from Influenza, Pneumonia (all forms), and Bronchitis registered in the Dominion between 1st August, 1917, and 31st December, 1918.

Provincial District.	1917.					1918.											
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Auckland ..	25	17	18	19	14	15	14	9	15	14	15	30	49	50	52	1,400	432
Taranaki ..	8	3	3	5	2	3	..	1	3	2	3	3	7	2	3	132	111
Hawke's Bay ..	5	7	4	5	5	1	1	3	2	4	7	15	11	3	1	159	150
Wellington ..	33	22	10	15	7	15	15	9	11	17	20	30	34	19	36	645	873
Nelson ..	2	3	4	3	1	1	1	4	3	1	4	10	11	3	2	57	34
Marlborough ..	1	2	..	..	1	..	..	..	..	1	3	5	2	5	1	17	27
Westland ..	4	2	3	3	2	..	1	..	..	2	1	3	3	2	4	66	18
Canterbury ..	30	28	18	13	2	10	6	11	7	11	21	30	49	17	32	571	213
Otago	15	11	21	12	9	9	3	7	6	10	19	13	34	32	15	267	234
Otago (Southland portion)	6	4	4	7	3	4	1	3	3	7	10	11	6	15	12	260	224
Totals ..	129	99	85	82	46	58	42	47	50	69	103	150	206	148	158	3,574	2,316

In Table VI are shown the deaths registered as being from pneumonia and other catarrhal diseases not registered as being secondary to influenza.

Table VI.—Deaths from Pneumonia, Bronchitis, Broncho-pneumonia, and Pulmonitis registered in the Dominion between 1st August, 1917, and 31st December, 1918.

Provincial District.	1917.					1918.											
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Auckland ..	25	16	17	18	14	14	14	9	15	13	14	27	47	45	32	101	29
Taranaki ..	7	3	3	5	2	3	..	1	3	2	3	3	7	2	2	6	1
Hawke's Bay ..	5	7	4	5	5	1	1	3	2	4	7	14	11	3	1	7	8
Wellington ..	33	22	10	14	7	14	14	9	11	16	19	30	31	18	26	54	39
Nelson ..	2	1	4	3	1	1	1	4	3	1	4	10	10	1	1	15	4
Marlborough ..	1	2	..	..	1	..	..	..	..	1	3	5	2	5	..	1	..
Westland ..	4	2	3	3	2	..	1	..	..	2	1	3	3	2	4	5	2
Canterbury ..	28	26	17	12	2	10	6	11	7	10	20	27	49	17	19	35	25
Otago	14	11	21	11	9	9	3	6	6	10	19	13	33	29	11	40	22
Otago (Southland portion)	5	4	3	6	2	4	1	3	3	7	8	10	6	15	12	16	9
Totals ..	124	94	82	77	45	56	41	46	50	66	98	142	199	137	108	280	139

It is probable that a considerable number of these deaths shown in Table VI should have been attributed to influenza, since there is in October, November, and December a very marked increase in the figures, which must be regarded as due to the secondary pandemic wave. However, taking these figures as they stand we find that the balance recorded as being due to influenza is as follows:—

Table VII.—Deaths directly attributable to Influenza registered in Dominion between 1st August, 1917, and 31st December, 1918.

Provincial District.	1917.					1918.											
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Auckland ..	..	1	1	1	..	1	..	..	..	1	1	3	2	5	20	1,299	403
Taranaki ..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	126	110
Hawke's Bay ..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	152	142
Wellington ..	..	..	..	1	..	1	1	..	..	1	1	..	3	1	10	591	834
Nelson ..	..	2	..	..	..	..	..	..	..	..	..	..	1	2	1	42	30
Marlborough ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	16	25
Westland ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	61	18
Canterbury ..	2	2	1	1	..	..	..	..	..	1	1	3	..	..	13	536	188
Otago	1	..	..	1	..	..	..	1	..	..	..	..	1	3	4	227	212
Otago (Southland portion)	1	..	1	1	1	..	..	..	..	..	2	1	..	..	..	244	215
Totals ..	5	5	3	5	1	2	1	1	..	3	5	8	7	11	50	3,294	2,177

There arises the question as to whether deaths from cerebro-spinal fever should be included in the last table, since this disease so commonly follows influenza and other catarrhal outbreaks, and in the camps many of the cases were due to this sequence. The following figures represent the results when deaths from cerebro-spinal fever are included:—

Table VIII.—Deaths following Influenzal Infections (whole Dominion), including those due to Cerebro-spinal Fever.

1917.					1918.											
Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
5	11	10	8	4	3	2	1	2	3	5	13	16	19	63	3,299	2,185

Table VII must be taken as representing the minimum deaths due to influenzal infection, and it does not include deaths occurring among the Natives, regarding whom the following particulars as to deaths are available :—

Table IX.—Maori Deaths from Respiratory Diseases from 1st August, 1917, to 31st December, 1918.

Provincial District.	1917.					1918.											Total.
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
Auckland	10	6	8	6	6	3	2	4	3	6	6	4	7	24	7	132	696	930
Taranaki and Hawke's Bay	1	2	2	..	..	..	..	1	1	1	..	1	..	3	1	18	176	207
Wellington	..	3	2	1	..	..	1	..	..	..	..	1	..	..	2	37	60	107
Marlborough, Nelson, Canterbury, Westland, and Otago	1	2	2	..	..	..	..	..	..	..	..	1	1	2	..	13	18	40
	12	13	14	7	6	3	3	5	4	7	6	7	8	29	10	200	950	1,284

It is not possible to say exactly what proportion of these Native deaths were due to primary influenzal infection, but it is obvious that the high returns for November and December were caused by the secondary pandemic wave spreading among the Maoris. It is also probable that the primary wave exercised its chief influence in September, when the death-rate is shown to be high. Of the twenty-nine deaths during the month, twenty-four of these Natives were in the Auckland Province.

That influenza was prevalent among the Natives from July onwards is shown by the following table, compiled from the reports of the medical officers in charge of Natives in the Wellington Province in regard to the cases attended by them :—

Table X.

	July.	August.	September.	October.	November.	December.
All forms of respiratory and catarrhal diseases	20	49	70	90	260	33
Influenza	15	41	63	83	250	24
Deaths from influenza ..	..	2	3	3	18	3

The majority of the earlier cases were in the Waiapu County. After September they were more widely distributed. A steadily increasing wave of infection from July onwards is very marked, as also the sudden rise in November, when the second wave became manifest. These figures represent only the more serious cases coming to the notice of the medical officers. They by no means represent the actual incidence.

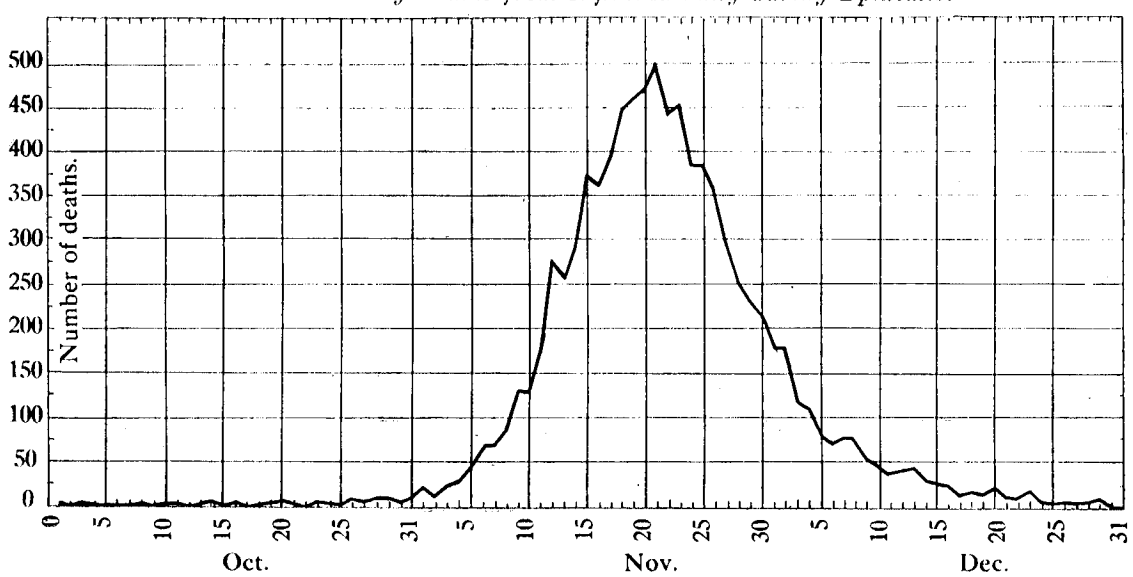
Table VII does not show any definite crest for the primary wave, but rather a steadily increasing virulence from July onwards; but as regards the secondary wave the abnormal returns for November show that the apex occurred in this month.

Examining in detail the figures indicating the deaths from influenza and its complications during the months of October, November, and December we get the following results :—

Table XI.—Deaths from Influenza during Epidemic.

	Number of Deaths during Week.
October 7—First week	3
,, 14—Second week	6
,, 21—Third week	13
,, 28—Fourth week	21
November 4—Fifth week	72
,, 11—Sixth week	423
,, 18—Seventh week	1,442
,, 25—Eighth week	1,860
December 2—Ninth week	1,045
,, 9—Tenth week	354
,, 16—Eleventh week	151
,, 23—Twelfth week	60
,, 30—Thirteenth week	21
Total	5,471

Chart A.—Showing Deaths from Influenza daily during Epidemic.



It will be seen from this that there was a very steady increase in mortality from the first week in October onwards; that it was not till the week ending the 4th November that the epidemic death-rate could be said to be established; that it rose rapidly in the first three weeks of November and reached its peak in the week ending 25th November, and then declined as rapidly as it began. The incidence is well illustrated in Chart A (attached). Probably were the actual incidence of the disease known the peak representing the greatest number of cases would be a week or so before the highest death-rate, but on this point we have no accurate information save the Camp sickness returns, which show the 9th November as the highest date of incidence. The disease spread very rapidly in the camps, and, like the North Island generally, began there earlier than the mean for New Zealand. We can then take the week ending the 18th November as representing the average peak wave of incidence for the whole Dominion.

It is of interest to compare the above figures with the following table, showing the deaths from influenza in the ninety-six largest towns in England :—

Table XII.

Week ending October 19	1,895
,, ,, 26	4,482
,, November 2	7,412
,, ,, 9	7,560
,, ,, 16	5,916
,, ,, 23	5,106

The crest of the secondary wave in England was then almost identical in date with that in New Zealand, a fact not without significance, and one to which further reference will be made.

It is possible now to sketch the general incidence of the two waves throughout the world.

The first wave began among the troops on the western front about April, spreading rapidly thereafter in Europe and America. It began to be epidemic in Britain in May, and reached its peak there in July. It began to be epidemic in New Zealand in July, and reached its peak in September. It then followed the usual course of an epidemic, spreading along trade routes—the delay of two months between the appearance in Britain and that in New Zealand representing the period which one would naturally expect would be occupied in its conveyance to the Antipodes.

The second wave did not follow the usual course of spread of an epidemic wave round the world, but began somewhat irregularly to appear among shipping at the end of August (*i.e.*, transports "Tahiti," "Chepstow Castle," and "Mantua" at Sierra Leone), and in localized outbreaks in Glasgow and other ports, and in the eastern States of America in September. It is not easy to fix exact dates, but definite explosive outbreaks appear to have been established somewhat as follows :—

Last weeks of September	Spain; Paris; Portugal.
End of September and first week of October	Cape Town; Quebec; Boston, U.S.A.
First and second weeks of October	British Expeditionary Force (western front); Eastern Canada; Natal; Italy; Greece.
Third and fourth weeks of October	Switzerland; Holland; Washington; New York; Sweden.
Last weeks of October and first week of November	Britain; western America; New Zealand; Peru; Denmark.
During November	India; China.

We see, then, that in five or six weeks this pandemic had covered the whole of the larger countries of the world with the exception of Australia, and that it had not followed any definite geographical course, but burst out simultaneously at places so far apart as Cape Town and Boston, and later in Britain and New Zealand. Its course when once established was comparatively brief. On comparing the returns for New Zealand with those given for various towns in America we find a very similar history, the wave developing rapidly and receding as quickly, covering in all about ten weeks; and this seems to have been almost the universal experience.

The case of Australia is one of peculiar interest, since, while the primary pandemic wave reached there in August and September, the secondary wave did not develop in common with the rest of the world, but was delayed till the end of January, 1919. Since then, instead of following the rapid course experienced elsewhere, it has lingered for six months, varying in intensity, but never reaching the acute virulence experienced in New Zealand in November, 1918. There is not the definite wave peak seen in this country, but apparently the period of greatest intensity was in the first week in May, both in Victoria and New South Wales. As Australia was the only country to establish strict quarantine measures in October, and to attempt to secure the general protection of the population by vaccines and other measures, it is impossible to avoid the conclusion that these precautions have thus altered the incidence of the epidemic.

Although the general appearance of the secondary pandemic of influenza throughout the world did not take the form of a wave advancing from one country to another, it is noticeable that such a wave form was shown in the countries attacked. Thus in Africa the spread was from the Cape to Natal; in America from east to west; and in New Zealand, as will be shown, from north to south.

The Epidemic in New Zealand.

From a study of Tables VII, IX, and X, and the camp returns in Tables III and IV, it is possible to gather a general knowledge of the incidence of influenza in 1918 in the Dominion. We can now consider in detail the special features of the outbreak.

Incidence.

It is not possible to estimate with any accuracy the proportion of the population, which suffered from influenza during 1918. Taking the two waves together it is probable that at one period or another the majority of persons of susceptible age in the Dominion were affected. The camp returns relate to persons at the most susceptible ages, and from these one gathers that between 30 and 40 per cent. suffered in the first wave, and about 50 per cent. in the second wave. Among the Native soldiers in Narrow Neck Camp practically all were affected in the second wave.

On a general rough estimate for the whole population it is probable that about 40 per cent. of persons in the Dominion were attacked during the second wave. In the camps about 10 per cent. of the cases developed pneumonic complications. As the camp population was composed of males at the most susceptible period of life it is probable that the proportion of pneumonic cases in the general population was much less. A series of observations made in Maryland, U.S.A., showed great variation in incidence, some towns being as low as 23 per cent. and others as high as 59 per cent. The average seems to have been an incidence rate of 28 per cent. of the population.

Mortality.

A study of Table VII indicates that 5,559 Europeans died from influenza during 1918. Of these deaths 38 were registered prior to October, and so may be regarded as due to the primary wave. This is little higher than the normal influenzal death-rate for average years. But although it indicates that the primary wave was not of markedly high mortality, it is not altogether safe to accept these figures as strictly representing the mortality from influenza. Prior to the severe secondary outbreak it was not always customary for medical men notifying death from pneumonia and such complications to indicate that the primary disease was influenza. On studying Table VI, showing the deaths from all catarrhal diseases other than influenza, we find an undue death-rate from this cause from July onwards, which suggests that the influenzal outbreaks had an influence beyond that shown in the registration figures. Instead of falling from August onwards, as is usual, the rate rises. Then, again, comparing the returns for the five previous years we find that the average number of deaths was 769, the highest being in the year 1915, with 829 deaths. In 1918 we find 1,326 deaths due to catarrhal diseases other than influenza. It is obvious that some influence was present making for a high death-rate from acute pulmonary infections; and, further, this influence was at work prior to the appearance of the secondary wave of pneumonic influenza, for taking the deaths from acute pulmonary diseases during the first nine months of 1918 we find that 835 had occurred up to the end of September, whereas during the five previous years the average for the first nine months was under 550. It is certain, then, that the primary wave of influenza was accompanied by an undue proportion of fatal pneumonic complications. If to these deaths we were to add those from cerebro-spinal fever the mortality rate would be even higher. It is not, however, possible to say what proportion of the cases of this disease were preceded by influenza, though we know from experience in the camps and from certain outbreaks in the Wellington Province more or less associated with the camps that in a number of cases influenza of the primary-wave type was the predisposing cause.

Mortality among Natives.

Table IX shows that 1,232 deaths from acute catarrhal diseases took place during 1918, of which 1,160 were during the months of October, November, and December. As the average Native deaths per year from all causes is about 750, the above figures show the heavy toll which influenza took among the Maoris. It is not at present possible to give the exact figures for influenza. It is significant that whereas in 1917 there were in September thirteen deaths from respiratory diseases, in September, 1918, there were twenty-nine such deaths, and we know from the medical officers' reports that influenza was prevalent among the Natives at this time, but we cannot estimate the actual figures for the first wave of infection with any degree of accuracy. There is less doubt as to the second wave. Comparing the figures for the last three months of the year in 1917 with those of 1918 we find in the former year twenty-seven deaths, as against 1,160 in 1918. It is safe to assume that about 1,130 of these deaths were due to influenza, yielding the high total death-rate of approximately 2·26 per cent. for the Native population

Excluding cases whose deaths during an attack of influenza might be attributed to other causes, the secondary wave of influenza, reckoned as from the 1st October to the 31st December, resulted in the following death-rates in the Dominion :—

	Deaths.	Deaths at per 10,000 of the Mean Population.
European	5,471	49·60
Native	1,130	226·00

The excess death-rate per 10,000 of population in the larger towns in America during the epidemic period was 50·0, so that the New Zealand rate for Europeans does not appear unduly high. In Cape Province, South Africa, it was 335·0, but this included many Native cases. In Natal it was 114·7.

Case Death-rate.

We have no figures showing the case mortality for the general population. In the military camps during the second wave about 4·5 per cent. of the total number infected died. Pneumonic complications arose in about 11 per cent. of the cases, and this was the chief cause of death. In addition to this, there were ten deaths from cerebro-spinal fever among the convalescents.

The case mortality in South Africa was given as 2·57 per cent. for Europeans of all ages and 5·9 per cent. for Natives. As the population of the camps in New Zealand was made up of males of most susceptible age the case death-rate of 4·5 is not excessive. In Maryland, U.S.A., the case death-rate for males between twenty-five and twenty-nine is given as 4·8 per cent., and between the ages twenty and forty as 3·6 per cent.

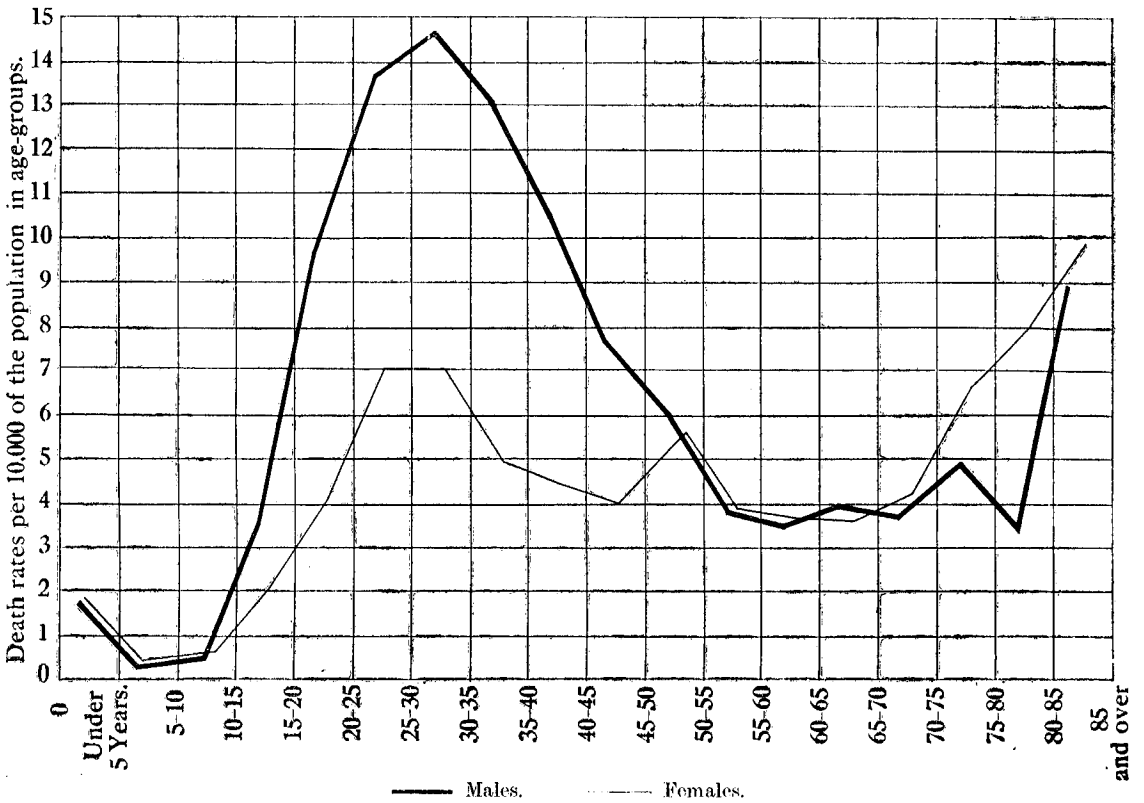
Influence of Age, Sex, and Race.

It is the general experience that males are more susceptible to influenza than females, and that in the present epidemic those of adult years were most severely affected. That this was the case in New Zealand is well shown in the following table :—

Table XIII.—European Deaths occurring during Epidemic in Age-groups

Age-group.	Males.			Females.			Both Sexes.		
	Number of Deaths.	Death-rate per 10,000 of Male Population.	Proportion of Population of each Age-group to Total.	Number of Deaths.	Death-rate per 10,000 of Female Population.	Proportion of Population of each Age-group to Total.	Number of Deaths.	Death-rate per 10,000 of Population.	Proportion of Population of each Age-group to Total.
Under 5	117	16·92	12·81	117	17·55	11·84	234	17·23	12·31
5 and under 10 ..	24	3·75	11·86	25	4·02	11·05	49	3·88	11·46
10 „ 15 ..	32	5·61	10·58	35	6·33	9·82	67	5·96	10·19
15 „ 20 ..	162	35·35	8·49	95	19·89	8·48	257	27·46	8·48
20 „ 25 ..	295	110·30	4·96	193	38·09	8·55	488	65·16	6·79
25 „ 30 ..	546	152·28	6·64	341	68·21	8·87	887	103·32	7·78
30 „ 35 ..	678	163·69	7·67	332	67·80	8·67	1,010	111·92	8·18
35 „ 40 ..	602	144·57	7·72	220	48·22	8·10	822	94·20	7·92
40 „ 45 ..	390	117·03	6·17	152	43·59	6·19	542	79·48	6·18
45 „ 50 ..	252	74·36	6·28	111	38·86	5·07	363	58·11	5·66
50 „ 55 ..	142	57·54	4·57	116	53·44	3·85	258	55·62	4·21
55 „ 60 ..	72	37·47	3·56	62	38·52	2·86	134	37·95	3·20
60 „ 65 ..	56	33·83	3·07	47	36·30	2·30	103	34·91	2·67
65 „ 70 ..	44	38·23	2·13	35	35·44	1·75	79	36·94	1·94
70 „ 75 ..	45	52·66	1·58	29	41·09	1·25	74	47·43	1·41
75 „ 80 ..	30	48·38	1·15	30	64·69	0·82	60	55·33	0·98
80 „ 85 ..	10	33·69	0·55	16	78·20	0·36	26	51·04	0·45
85 „ 90 ..	7	74·47	0·17	7	94·85	0·13	14	83·43	0·15
90 „ 95 ..	1	67·57	0·03	..	..	0·03	1	32·26	0·03
95 and over ..	1	333·33	0·01	2	590·00	0·01	3	428·57	0·01
Totals.. ..	3,506	64·96	100·00	1,965	34·88	100·00	5,471	49·60	100·00

Chart B.—Showing Death-rates per 10,000 of the Population in Age-groups.



Age.—From this table it will be seen that, ignoring the three deaths over ninety-five years,,the highest death-rate was among persons between thirty and thirty-five. Of the total deaths 2,719—or almost half—were among persons between the ages of twenty-five and forty, though only 24 per cent of the population are between those ages. In the Featherston Training-camp an analysis of over 2,000 hospital cases showed that, though men of from twenty to twenty-five yielded a high proportion of cases, the death-rate amongst such cases was proportionately less than among those of twenty-five to forty. Pneumonic complications arose in 8·8 per cent. of the cases among men under twenty-five, and in 12 per cent. of cases among men from twenty-five to forty. The younger men were perhaps equally susceptible to influenza, but were not equally liable to pneumonic complications, and, where such complications developed, were more able to combat the effects. Thus, taking the more serious pneumonic cases the young men showed a case death-rate of 57 per cent., while among the older men the rate rose to 72 per cent. Table XI shows that under twenty the death-rate is very low, especially between the ages of five and fifteen. After forty the death-rate again declines until the more advanced ages are reached. The figures among the aged are rather too small to yield reliable data, but tend to show an increasing mortality again. The United States Public Health Report for the 14th March, 1919, makes an analysis of 13,000 cases of influenza which occurred in Maryland during the epidemic period. Discussing the influence of age the following comment may be quoted:—

"The death-rate of influenza according to age is not an indication of the case incidence; while the incidence rate is highest among children of five to fourteen, and drops off in the older ages, the death-rate is quite low among children of these ages, and is markedly high among adults of twenty to forty-four, and among adults of advanced ages, although the number of persons in the advanced ages is relatively small."

This observation certainly applies to the death-rate in New Zealand, as shown in Table XIII and to the limited observations made among the soldiers at Featherston Camp.

Sex.—That influenza was a more fatal disease among males than among females is evident from the Government Statistician's return in Table XIII; the death-rate per 10,000 among the former being 64·96, as against 34·88 in the latter. It is interesting to note, however, that among children under fifteen years of age the proportion of deaths was slightly higher for females than for males, while in ages above fifty years there is a tendency towards an increased proportion for females. In the figures for Maryland, quoted above, the same higher death-rate for males is seen, and the same tendency for the female death-rate below twenty and above fifty years to equal or surpass the male rate. A suggested explanation is that adult males are more exposed to unfavourable conditions than females in their conditions of work and living. This would not apply to children and those of advanced years, hence the disparity in death-rate disappears.

Chart B graphically displays the variation and mortality due to sex and age. It will be noticed that there is a marked rise in the female death-rate between the ages of fifty and fifty-five, dropping to the normal curve between fifty-five and sixty. Possibly this is merely a chance variant, a result of dealing with small figures.

Race.—From the fact that 1,130 deaths out of 6,600 should have occurred among Natives, who represent under five per cent. of the total population, it is evident that the Maoris were exceptionally liable to attack by influenza in the more fatal forms. A similar susceptibility among Native races has been the universal experience. I have already quoted the case mortality in South Africa, which for Natives was double that of Europeans; and from the reports of the spread of the pan-

demic through the Pacific it is certain that the Natives suffered far more severely than Europeans. Presumably this susceptibility is due to a lack of inherited and acquired resistance to invasion by catarrhal infective organisms—a resistance which comes to the town-dweller in greater or less degree at the cost of an endless succession of those mixed infections popularly called "colds."

Incubation Period.

So far as any evidence on the matter has been forthcoming during the outbreak of influenza in New Zealand, there is nothing to indicate an incubation period of more than forty-eight hours. In some cases it was under thirty-six hours and in other cases even less.

Period of Infectivity.

There was evidence that the cases were very infective in their earliest stages. Infection was known to be transmitted within twelve hours of the beginning of the attack—before the symptoms were such as to enable a diagnosis to be made. There is some evidence that infectivity ceases at an early stage. Certainly among the attendants in the temporary convalescent hospitals no case of infection has been recorded. The patients were sent to such hospitals about the seventh or eighth day in the average case, so that it seems probable that the infective period was over during the first week.

Channels of Infection.

As regards "carriers" we have little evidence. In one case investigated there was some reason to suspect that infection was introduced into an isolated house by a person who had recovered some three weeks before; but one cannot in such cases be sure that all other channels of infection were closed. In two cases reported there was some evidence of infection being carried by letter. One of these, reported by Dr MacNaughton, of Samoa, was a Native living in a group of islands in the Pacific who developed pneumonia shortly after receiving a long letter from a Native friend in hospital at Narrow Neck Camp. No other possible source of infection could be traced, and this was the only case on the island. Possibly the virus, although readily destroyed by drying, might survive for a short time if sufficiently imbedded in inspissated mucous and kept, as in a folded letter, away from light and air The conditions would require to be unusual, and the evidence is at best inconclusive. The evidence generally is wholly in favour of direct conveyance of infection from person to person by means of minute air-borne droplets of saliva scattered in the act of speaking, coughing, &c.

Bacteriological Features.

Bacteriological observations during the second wave were, unfortunately, much limited owing to the depletion of staffs in hospitals and camps. The bacillus of Pfeiffer was detected in both the first and second waves, but during the second outbreak the report of the Professor of Bacteriology at Dunedin University indicates that it was less in evidence in the earlier cases of the acute infection, but became more prominent again as the epidemic waned. Dr. Pearson, at Christchurch, found it in the pneumonic cases during the epidemic.

Pneumococci and streptococci—the latter of which tended to take on a diplococcal form—were found by all observers, but were not confined to the secondary outbreak, since the Government Bacteriologist reported that he had found both organisms in cases occurring in the military camps and the Wellington Hospital prior to October.

The fact that a certain degree of immunity against the second wave of infection was produced by a recent attack of the primary-wave type of influenza establishes the bacteriological identity of the two outbreaks. It is of some interest to recollect that this diplococcal streptococcus was a feature in the pneumonic outbreak among troops in the New Zealand transports calling at American Atlantic ports in 1917. These pneumonic cases were preceded on that occasion by attacks of measles. Associated with influenza—which is a disease against which there is little acquired protection, and therefore enjoys a wide field of activity—this streptococcus has every opportunity to acquire, through rapid transference from case to case, a high degree of virulence, and doubtless this is what occurred. There was no reason to believe that we were dealing with any infective organism other than those usually associated with catarrhal outbreaks. In this case, however, conditions throughout the world had been favourable to these organisms attaining an abnormal infectivity.

Immunity conferred by Previous Attacks.

Evidence that infection a month or two earlier during the first wave did not confer complete immunity from infection of the second-wave type was abundant both in camps and elsewhere; but the Principal Medical Officers, both at Trentham and Featherston, found evidence that there was a certain degree of protection—at least, against the more severe complications—conferred by the primary attack. Instances were not uncommon in civil life in which the members of families who had been the sole sufferers during the first outbreak were alone free from infection in the second. Dr. Pearson, Bacteriologist at Christchurch, found in November evidence of partial immunity in persons infected as far back as September. Dr. C. S. Davis, Medical Officer to the Maoris at Waiapu County, in a very complete report on the epidemic as it affected the Waipiro Bay district, found that those who had recovered from the earlier epidemic of August and September suffered much more lightly in the November outbreak. Indeed, in his district the earlier wave was the more fatal of the two. Dr. Weeks, also reporting from Tolaga Bay, says the Maoris who suffered most in the first outbreak were little affected by the second. The evidence from the camps suggested that this immunity was evanescent and became very slight after eight weeks. The general experience seems to be that country dwellers suffer more than town dwellers in such pandemics, so doubtless there is a certain degree of permanent immunity derived from repeated invasions by catarrhal infections.

Course of Spread of Influenza in New Zealand.

Primary Wave.

In regard to the primary wave of influenza there is little evidence as to where it first appeared. It was evident in the camps in July, as we have already seen. In Table VII we see a slight increase in deaths from influenza in July in the Auckland and Canterbury Provinces. From the reports of the Native Medical Officers in the Auckland and Wellington Provinces, in which by far the larger part of the Native population is to be found, we learn that severe influenza cases began to be observed also in July.

Then, in the Auckland Province we find the following cases reported:—

Month.	All Catarrhal Diseases.	Influenza.
July	11	4
August	20	3
September	44	15

and in the Wellington Hawke's Bay Provinces:—

July	20	15
August	49	41
September	70	63

It seems to have been specially severe among the Natives of the northern Hawke's Bay districts during these three months, and must also have affected the white population, since in Table V we find twenty-nine deaths from catarrhal diseases in this district alone. Another localized outbreak of marked severity occurring in July was reported from Waione, near Dannevirke, where in a small settlement thirty-one persons were attacked with influenza, of whom eleven had pneumonic complications. Six of the cases occurred in one household, four of whom had pulmonary complications. During August the epidemic seems to have become more general and to have reached an apex in September, as in Table II we find that the figures in the camps for these months were—July, 145; August, 571; September, 1,216. A temporary lull early in October followed, as the camp figures for that month were 1,116, of which most occurred in the latter half of the month when the secondary wave was developing force. An examination of the statistical records of the principal complications of influenza—acute pulmonary bronchitis and cerebro-spinal fever—show a like rise during July, August, and September. Thus in Table V we find 504 deaths from catarrhal diseases during these months, and a higher death-rate in August than in October. Contrasting the months of August and September of the previous year we find 228 deaths, while for 1918 there were 354 deaths.

As regards cerebro-spinal fever, the notifications in the camps showed but one case in the first seven months of the year, four in July, twelve in August, and two in September. Among the civilian population there were seven notifications in the whole of the first half-year, one in July, fourteen in August, and fourteen in September. Of these twenty-nine cases in the latter three months, twenty occurred in Wellington and Hawke's Bay Districts.

So far as one can judge from the imperfect data relating to the primary influenza wave, while it appears to have been universally present in all districts, its appearance was most severely felt in the Wellington and Hawke's Bay Provinces during July and August; but there is no evidence that it spread from there. Doubtless the presence of the military camps increased the incidence. It was characterized by localized explosions of violence such as those already mentioned near Danevirke, and at Waipiro Bay in July and August. During August also a Cadet camp at Palmerston North suffered somewhat severely. In August Canterbury perhaps suffered most heavily, since there we find forty-nine deaths from catarrhal diseases out of 206 for the Dominion, this being the highest for any province. In September, however, the Auckland and Otago Districts show the heaviest incidence of cases. Thus in Table V we find in that month fifty deaths from catarrhal diseases at Auckland out of a total of 148 for the Dominion, Otago being next with thirty-two deaths. Five of the fifty deaths at Auckland are attributed to influenza, but probably many more would have been so attributed had the medical profession then had the knowledge which was gained from the outbreak of November. In Auckland ninety deaths from catarrhal diseases occurred in August and September, as compared to forty-two in 1917 for these two months.

Comparing the provincial returns we find for the months of August and September,—

	1917.	1918.
Auckland	42	90
Wellington	55	52
Canterbury	58	66
Otago and Southland	36	82

Otago and Southland thus also are seen to have shown an unusual proportion of deaths from acute catarrhal troubles; but it is more noticeable in the case of Auckland, since in the winter months Dunedin has generally a higher percentage of deaths from these causes. Taking the returns for the Auckland metropolitan area the Registrar-General has supplied the following figures:—

Table XIV.—Death-rate per 10,000 from Pneumonia.

Average for Six Years, 1912–17.	1917.		1918.		
	August.	September.	First Seven Months.	August.	September.
3·28	1·79	2·69	2·11	9·50	12·66

It will thus be seen that August and September showed abnormal death-rates for pneumonia in Auckland in 1918. From the evidence of many medical men in practice in and about Auckland it is now known that many of these excess deaths from pneumonia were the result of complications following influenza of the clinical type so familiar subsequently in November. Catarrhal diseases other than pneumonia also show an increase in September, thus influenza rose from an average death-rate of 0·45 to 1·06, and broncho-pneumonia from 1·23 to 3·17. Table IX shows also that among Natives the deaths from catarrhal diseases rose abnormally during September in the Auckland District, since twenty-four occurred there out of a total for the Dominion of twenty-nine.

The conclusion, then, must be drawn that the primary wave of influenza became specially virulent in Auckland during the month of September.

Secondary Wave.

From the Chart A we learn that fifty-nine deaths attributed to Influenza occurred in October, whereas only thirty-eight deaths were registered in the preceding nine months of 1918; and in Table XI we see that three of the cases occurred in the first week in October—in itself a high proportion—and from then rose steadily week by week till the fifth week, after which the increase was so sudden during the sixth, seventh, and eighth weeks to warrant the term "explosive" being applied to the outbreak. In Table II we see that in the military camps, although there were 1,116 cases of influenza, only two deaths occurred during the month, and till the last week or so the epidemic tended to die down. But the recrudescence at the end of October is very significant, since it was connected with the return of men from Auckland, where they had been on leave. Thus at Awapuni Camp the increase followed the arrival on the 28th October of a man from Auckland who subsequently developed influenza of the pneumonic type. Similarly, at Featherston the epidemic received a fillip about the 26th October with the arrival of a C1 draft from Auckland, among whom after a short time the typical pneumonic cases began to arise. At Trentham the definite secondary wave did not begin till the 3rd November, and here its beginning followed the arrival of a draft from the already infected Awapuni Camp. At Trentham the earliest case of pneumonic influenza occurred on the 16th October in a man who arrived from Auckland on the 9th October, but the case was not followed by any marked spread of infection. As the larger camps received their secondary-wave infection from Auckland the history of influenza among the men in the Auckland camps is of special interest, and here we find that both at Narrow Neck Camp among the Native soldiers and in the garrison troops at the North Head Forts there was an explosive outburst, beginning on the 5th October, very short and sharp, but not followed by fatal results. At Narrow Neck in four days 226 cases were reported, thirteen of whom showed pneumonic symptoms; and among the small garrison at the forts thirty-three cases, eighteen of which were severe, occurred in the first week of October. Then followed a lull of about two weeks with few cases, but on the 24th October they began to increase slowly for the first four days, but rapidly on the 28th October and the following days the wave reaching its crest in the first three days of November. It then waned rapidly, and died out on the 18th November, but by then seventeen Native and five European soldiers had died. These camps at Auckland furnish the earliest record of the secondary wave of infection, and the two outbursts coming in quick succession form a very remarkable history, suggesting that throughout October influenza of unusual virulence was abroad in the district. This is confirmed by the District Health Officer, Auckland, Dr. Hughes, who found on inquiring among medical practitioners round Auckland that many cases of influenza of the same type as characterized the November outbreak had been under their care. He thus obtained records of five cases of pneumonic influenza in August, five in September, and eleven in the first twelve days of October, in which period also he traced eighteen cases of influenza of the hæmorrhagic type. A number of these were in the neighbourhood of Narrow Neck Camp. That an epidemic of influenza of virulent type was present in Auckland early in October we learn also from the newspaper reports of that period. Thus in the *New Zealand Herald* of the 9th and 10th October special articles appeared describing the epidemic as of widespread proportions, and as being more virulent than previously, and generally emphasizing the serious position of affairs. It is interesting to note that this occurred prior to arrival of the R.M.S. "Niagara," which is popularly supposed to have brought the new type of infection.

The Registrar-General's returns show that of the fifty-nine deaths from influenza in the Dominion during October thirty-four occurred in the Auckland Province, and that in the last three days of the month fourteen deaths occurred there, as against two in the rest of the Dominion. Taking the above facts into consideration, and the history of the increasing virulence of the primary wave during September in Auckland, we may conclude that this increase of virulence continued in this district through the earlier parts of October with steadily advancing power, and that in some manner the infection was so reinforced as to produce an explosive effect in Auckland in the last few days of the month. The epidemic spread with great rapidity after the 26th October, and by the 5th November had reached alarming proportions. The crowding due to the news of the Armistice on the 8th November produced in Auckland City a marked increase in cases, and the crest was reached about the 12th November. The highest number of deaths in one day throughout the province was registered on the 12th November, which we may take, then, as representing the crest of the wave; but the epidemic, though it declined rapidly in Auckland and suburbs in November, still produced outbreaks in various parts of the province till about the 14th December, after which matters became normal.

We have already traced the spread of the secondary wave from Auckland to the military camps, and may now follow it to other parts of the Dominion.

In the Wellington Province the registration of deaths shows an increase on the 1st November and a maximum on the 21st November, returning to normal about the 20th December. The incidence of the wave in the city was over by the 6th December. Prior to the 1st November the deaths in Wellington City from catarrhal complaints had not shown much increase over former years, though cerebro-spinal fever was abnormal.

The District Health Officer reports that the disease spread by rail and steamer from Auckland, the earliest known cases at Wellington being those on board the cable-steamer.

In Taranaki the severe type appeared about the 26th October among persons arriving by train from Auckland. (This date coincides with that for the introduction into Featherston Camp.)

In Palmerston North district the agricultural show at the beginning of November appears to have been a factor in spreading the epidemic, which came thence to Waipawa district.

In Hawke's Bay Province the secondary wave can be traced to the arrival at Gisborne of the s.s. "Mako" from Auckland on the 27th October, Napier being reached later.

In Canterbury there appears to have been some increase in the early part of October though not at first of a fatal type. Thus we learn of a sharp outbreak at Christ College, beginning on the 8th October and reaching its crest on the 15th October, when 127 boys had been attacked. Virulent pneumonic influenza had been met as far back as August, and pneumonia seems to have been fairly prevalent in September and October, as there were in these months sixteen and thirty-five cases respectively admitted to Chistchurch Hospital, as compared to twelve and seven in 1917; but the definite secondary wave outburst does not appear to have established itself in Christchurch till about the 6th November, when seven cases were admitted to hospital. The greatest number of admissions was on the 20th November, which may be taken as the crest of the wave in this city. The principal factor in the spread of the epidemic in this district was the race-carnival week, beginning on the 4th November, which brought many people from Auckland and Wellington and produced temporary overcrowding in hotels, trams, and trains. The crowd assembling in the streets on the 8th November, on the occasion of the first Armistice reports, aggravated matters here as elsewhere.

In Otago and Southland the District Health Officer found that the second wave was introduced about the 6th November by people returning from the Christchurch race carnival. In Southland the winter race meeting seems to have been a factor in spreading the infection. Here deaths began to be recorded about the 9th November. In Dunedin the largest number of deaths were on the 24th November; in Invercargill on the 26th November, and this latter date may be taken to represent the crest of the epidemic throughout the provinces. It may be said to have disappeared by the 25th December.

It is thus obvious that the second outbreak took the form of a distinct wave which travelled from Auckland southwards by means of railway and shipping, beginning to spread as a wave about the 26th October, and reaching the southern districts about the 9th November, thus taking about a fortnight to travel through the Dominion. It is interesting to note that the wave seems to have lessened in virulence as it advanced.

The Government Statistician's returns show that the death-rate per 1,000 of the population in the cities during 1917 and 1918 was as follows:—

	1917.	1918.
Auckland	12·36	21·40
Wellington	10·05	16·59
Christchurch	12·13	17·15
Dunedin	12·23	16·40

Dunedin city, which generally has the highest deat-rate, this year, in which the figures are all abnormal by reason of the epidemic, shows the lowest rate, while that of Auckland is strikingly high.

The following table shows the death-rate during the epidemic in each provincial district:—

Table XV.—Deaths from Influenza during Epidemic, showing Deaths in each Provincial District.

Provincial District.	Number of Deaths.	Deaths per 10,000 of the Population (1916 Census).
Auckland	1,680	54·45
Hawke's Bay	296	54·55
Taranaki	282	50·56
Wellington	1,406	62·83
Nelson	62	12·91
Marlborough	39	23·94
Westland	83	58·90
Canterbury	743	41·55
Otago { Otago	436	33·08
Otago { Southland	444	74·81
Total	5,471	50·16

General Measures adopted to combat the Epidemic.

As is to be expected in the case of an epidemic so explosive in its onset and so general in its incidence as was the influenza of November, 1918, the organized efforts of the whole community were required to provide aid for the sufferers and to stay the course of the disease. Citizens' committees were set up in the various districts, whose functions were to provide food and attention for stricken households, to summon medical assistance where necessary, and to arrange for the transport of serious cases to the hospital. In addition, in some districts these committees undertook the equip-

ping and management of temporary hospitals. Various bodies such as the St. John Ambulance Brigade and Association, the Red Cross Society, and the Women's National Reserve offered their services freely and worked in conjunction with the committees. The work carried out by these different organizations at a time of national stress cannot be too highly praised. In recognition of this the issue of testimonials to those whose work had in particular come to the notice of the Department was authorized.

Despite the fact that the milder cases were, as far as possible, nursed in their own homes the existing hospitals were soon full to overflowing. In order to accommodate the large number of serious cases emergency hospitals had to be opened, and for this purpose free use was made of schools, halls, and other public buildings. To those who so readily placed at our disposal the use of suitable buildings for hospital purposes the gratitude of the whole community is due. In the equipping and staffing of these temporary institutions the fact that Defence stores could in some centres be drawn upon proved a great boon. But for the organization of the Defence Medical Stores Department there would have been a serious shortage of drugs and other necessaries in the Dominion. In the Wellington Province the services of the Army Medical Department, of the Ordnance Department, and of the Army Service Corps were of the greatest value in dealing with the epidemic, and have been the subject of special memorandum of thanks to the officers concerned.

At the commencement of the epidemic no fewer than 228 doctors were absent from the Dominion on military service; many doctors, moreover, contracted the disease. It was therefore imperative that the time of the doctors should be saved as much as possible. Consequently in the larger towns the "block system" was evolved, under which each doctor had his own special district, and overlapping of medical service was reduced to the minimum.

Immediately on commencement of the epidemic pamphlets were prepared by the Department giving advice to sufferers from the disease, to convalescents, and to the general public. These were published and circulated as freely as possible.

Trial was made by the Department as a prophylactic measure of the inhalation treatment with 2 per cent. solutions of zinc sulphate atomized by means of steam under pressure. Chambers for such treatment were established at railway-stations, at wharves, and in all centres of population. There is no convincing proof, however, that the procedure was of any value when applied to the general public.

In influenza, where the disease is spread through personal contact, congregations of people are to be avoided. Accordingly, at an early stage of the epidemic measures were adopted to prevent public meetings and gatherings. Schools, theatres, picture-theatres, billiard-saloons, and other places of amusement were closed. Barbers' shops, hotel-bars, tea-rooms, and other places of business which might prove likely foci of infection were similarly treated.

Other measures adopted by the Department were the gazetting of influenza as a dangerous infectious disease, the prohibition of tangis, the prohibition of the sale of alcohol, except on a medical prescription, and the enforcement of burial of the victims of the disease within twenty-four hours of death.

Prophylactic Measures.

Inhalation Chambers.—In regard to the value of inhalation-chambers, some doubt has been expressed by observers as to the efficiency of this method of combating influenzal epidemics. The experience of two years and a half in the military camps in New Zealand is wholly favourable to the use of weak solutions of zinc sulphate as an inhalation. The systematic treatment of all recruits whose throats showed abnormal bacterial contents, and of men leaving hospital or returning from leave, undoubtedly checked epidemics of measles, and reduced the complications following this disease and influenza. The value in checking infection by the meningococcus and by diphtheria has been abundantly shown. In regard to influenza, the invasion is so rapid that unless the treatment is repeated very frequently and soon after exposure to infection the value of inhalation is reduced. The opinion of the Principal Medical Officers was that during the second influenzal wave as soon as the temporary disorganization caused by reduced effective staff was overcome, and the inhalations were applied regularly and frequently, a marked reduction in pneumococcal complications resulted. On the troopships, too, infections of a catarrhal nature greatly lessened after the chambers were installed and used systematically. Some brief observations made by Colonel Leahy at Trentham Camp during the November outbreak showed a reduction from 50 per cent. of severe cases among untreated men to 22 per cent. among men who were treated daily for three successive days. Casual exposure in an inhalation-chamber at irregular intervals cannot be expected to yield results. The treatment should be repeated within a few hours of each exposure to infection, thus its value, probably, can only be appreciated when it is available to the occupants of an institution—say, an office or factory—and applied compulsorily perhaps twice a day. The public chamber is of questionable value, more especially if those who are awaiting treatment are allowed to congregate in crowds. On trains and ships, if applied to the passengers during the journey, some value may result; but the chambers at the stations and wharves were generally productive of crowding, and so their value was minimized. Institutional installations, therefore, are recommended, but for the general public some simple form of apparatus suitable for family use is likely to be of more value than public chambers. The use of inhalants of an irritating nature in too strong solution proved harmful, as they only made the mucus surfaces of the naso-pharynx liable to infection. Frequent washing-out of the nose and mouth with simple salt solution is probably as valuable a family remedy as any which can be suggested. For inhalation plants the use of compressed air in place of steam was found very satisfactory, as the atmosphere of the chambers was less humid and relaxing, and any stoppage of the suction of the inhalant solution became at once noticeable.

In regard to masks there was little experience in New Zealand. Where they were made available in temporary hospitals the attendants generally refused to use them. The experience in Australia does not seem convincing. It is certain that to wear a mask in the open street and take

it off on entering a shop or office is reversing the order dictated by common-sense. Probably it would not be possible to enforce the use of masks other than in trains, trams, and other public conveyances, and here their use would probably be of value.

Of inoculation the experience in New Zealand is practically confined to the troops. The results of vaccination in England and France were certainly encouraging, not as a prevention of infection so much as a means of reducing the more serious complications by raising the resistance of the body to pneumococcal and streptococcal invasions. Immunity thus acquired, unfortunately, appears to be very evanescent.

Quarantine.—Theoretically it should be possible to exclude a pandemic wave of influenza from an island community. A brave effort in this direction was made in Australia, but, as we know, has failed. It seems probable that the failure is due not to defects in the quarantine system established on the 16th October, but to the fact that even then it was too late and the elements necessary for the epidemic had already established themselves in the Commonwealth. In this connection we cannot do better than quote Sir Arthur Newsholme, whose wide experience led him to the conclusion that no measures existed which could resist the spread of pandemic influenza, chiefly because we were not able, so far, by bacteriologized or any other methods to distinguish between the normal bacteria of simple "colds" and those which were of a virulence so heightened as to have epidemic potentialities.

Factors influencing the Epidemic in New Zealand.

We have followed the history of the two waves of influenza in New Zealand, and have traced the obvious connection between the first wave and the pandemic in Europe and America which began in April. We have not yet, however, attempted to explain the appearance of the secondary wave of highly virulent pneumonic type, which, as we have seen, did not spread as a wave from country to country, but arose apparently independently and almost instantaneously in every part of the world, so that within four or five weeks it was raging universally. Attention has been drawn to the curious anomaly that while this pandemic did not spread as a wave round the world, yet in New Zealand, as in America and South Africa, when once established it was capable of spreading in wave form very rapidly throughout these countries.

Evidence has been quoted showing that this secondary wave was intimately connected in its earlier stages with shipping, and we know that the establishment of strict quarantine in Australia on the 16th October modified and delayed the spread in the Commonwealth. Yet everywhere the exact part played by shipping has been obscure, chiefly from the fact that seldom has it been possible to trace the implantation of the peculiar infection to any one vessel from overseas. In each country there has been what may best be described as an incubation period, during which the wave in its earliest stages was gaining virulence and power, and in most countries there has been a merging of the first wave in its apparently final stages with the earliest development of the second wave.

The first question which we have to determine is whether the secondary wave was a simple working-up in virulence of the infectious organisms which were brought to the different countries during the first wave.

Relationship between First and Second Waves.

To the student of bacteriology there is nothing inconceivable in the possibility of an organism, by rapid transference from case to case under favourable surroundings, being changed from a harmless saprophyte to a very virulent infective parasite. The epidemiologist meets with such cases constantly in his work—an epidemic altering in character during the course of its spread from mild to severe, and *vice versa*. After all, bacteria are merely plants of low development, and like all plants they thrive on a favourable soil and languish in a resistant one. There is nothing stable about the virulence of an infective organism, and this applies to the influenzal group as to others. But there is this peculiarity as regards the virulence of the first wave of infection in 1918: that, whereas in ordinary epidemics the power fails as the wave recedes, this one showed a recrudescent power. We have observed this in New Zealand, especially at Auckland and Otago during September, and in other countries there was the same increased virulence during this month.

The first wave in itself was an abnormal one, at least in Britain, as Newsholme has pointed out, since it came as a midsummer outbreak, a thing hitherto not recorded. The usual course of influenza in Britain is for the second wave of infection to appear in the very cold season, and until 1918 an interval of perhaps seventy weeks usually elapsed between the waves, the shortest previously being thirty-five weeks. The October wave was only sixteen weeks behind the first. But never before in the world's history were conditions more favourable to the spread of disease. The huge bodies of men gathered together in training-camps throughout the world and then hurried overseas in conditions of unavoidable crowding, and the concentration in Europe of these overseas bodies of men has never occurred before on such a scale. The massing-together of recruits drawn from country districts has produced an ideal field for the cultivation of infective organisms, since these men have not had time to acquire immunity to these organisms. In our own camps it was found that of the victims of cerebro-spinal fever 70 per cent. were farmers or country dwellers.

Again, in Germany, Austria, and Bulgaria were prison camps in which overcrowding, semi-starvation, and appallingly insanitary conditions produced exceptionally favourable conditions for the exhaltation of infection. In many countries, too, the general resistance of the population was lowered by insufficient nourishment. Viewing these conditions it is not difficult to account for the abnormal features which during 1918 took by surprise the sanitary authorities of every country.

In addition to these abnormal conditions of population throughout the world, unusual meteorological phenomena have been prevailing for some time; and exceptionally wet and cold weather, which resulted in a very marked increase in disease affecting plant-life. We thus find in 1918 horticulturists in Britain and America, as well as in New Zealand, reporting outbreaks of brown-rot, black-spot, and so forth. Low forms of plant-life, whether parasitic to man or to vegetation, found in this year conditions favourable to their spread.

Yet although the existence of these conditions was such as to make possible the exhaltation of the virulence of the organism concerned in the primary epidemic to the pitch necessary for the production of the violent explosion of November, there are certain features in the history of the latter which make the problem a more complicated one. It is scarcely conceivable, for example, that the conditions in New Zealand were such as to exhalt the existing virus during September and October to the same extent as would be the case in Britain to which huge masses of troops were daily arriving from overseas. Nor could we compare the climatic conditions prevailing during these months in countries so widely different as Holland, Peru, and New Zealand.

Examining the conditions in the Dominion alone we find reason to doubt whether the second wave was the result merely of simple increase in virulence of the primary infective organisms.

It would be difficult, for example, to explain why the localized outbursts of high virulence which were recorded in August among the Natives did not spread and develop into the second wave. Nor would this theory account for the fact that, though there appears to have been a tendency to increase of virulence both at Auckland and Otago during September, it was from Auckland that the secondary wave spread. Some additional factor, then, was added during September or October to the forces which already were encouraging a recrudescence of the epidemic, and this factor was of such potency that it produced an epidemic of explosive type. We have already seen that in its earliest stages the secondary pandemic wave was associated with shipping activities, and we also have the evidence of the history of the epidemic in Australia, pointing to the fact that the additional factor required was carried from overseas during October. The stringent quarantine regulations adopted by the Commonwealth on the 17th October certainly delayed the development of the secondary wave of virulent influenza, though it was not able to prevent its appearance some three months later. The Australian experience suggests that, though the primary infection had all the potentialities for a violent recrudescence, the factor from overseas was able to accelerate the increase of virulence of the existing organisms so as to produce an outburst of explosive violence very much sooner.

Newsholme points out that the war conditions in Britain in 1918 resulted in successive accretions of infective of exhalted virulence being added to the already existing infection, and accounts thus for the outburst of October. In a degree proportional to our population we were receiving in New Zealand similar accretions of infection during the latter half of 1918, and doubtless this would account for the rising virulence in September and October. But this massing of infection would not be equally distributed in all countries visited by the November outburst, so it seems probable from a comparison of the pandemic in these countries that during these months there was being distributed over the world a more specific type of infection, and that this infection was not introduced in epidemic form, but as a more or less dormant virus, which required only admixture with the already existing active influenzal organism, under the favourable conditions which we have already questioned, to produce the explosive type of outburst of unusual intensity which characterizes the secondary wave the world over. It is not necessary to assume that this specific type of infection was other than one or more of the organisms usually associated with catarrhal epidemics. The features which would mark it as a specific type of infection require only that it should be of exhalted virulence, or have unusual potentialities for exhaltation of virulence, given a suitable nidus. The nidus, we know, existed in all civilized countries in September and October.

It is not impossible that a strain of pneumococcus or streptococcus such as was found associated with measles in the American camps in 1917 should take on these peculiar characters, and that when living in symbiosis with influenzal bacilli, and with each other, should acquire potentialities for an outbreak such as that which visited New Zealand in November; nor is it impossible that such organism should be distributed by "carriers" who had themselves recovered from prior attacks of influenzal infection of pneumonic type.

We need only quote the now well-recognized example of the meningococcus to establish the existence of such possibilities as to carriage, and as to potentialities for evil when favourable symbiotic conditions are established.

Introduction of Specific Type of Infection to New Zealand.

Assuming, then, that this distribution was taking place, it remains only to inquire how the special virus may have been introduced into New Zealand. In making this inquiry it is necessary to remember that it is possible, and, indeed, probable, that these organisms of specific virulence might remain more or less dormant for a considerable time. They might not at first find the exact conditions necessary for their full development. Taking again the analogy of the meningococcus, we know that this organism requires not only aggregation of susceptible persons, but also it is necessary that acute catarrhal infections, such as measles or influenza, should be prevalent among these persons.

Probably the same laws govern the growth of these pneumonia-producing organisms, which thus might be widely spread before their potency was revealed. On this theory we could account for the absence of a definite world wave spreading from country to country which was a feature of the second pandemic. Naturally, successive additions of infection of increasing virulence would tend to produce a more severe outburst, as pointed out by Newsholme. As we have been able to trace the November outburst to Auckland in October, we must seek there for evidence of the introduction of these exhalted strains of infection.

Influence of the Arrival of the "Niagara."

Popular opinion attributes the whole outbreak to the arrival of the mail-steamer "Niagara" on the 12th October. This is not surprising, since this vessel had many cases of influenza on board, some of them of severe type, and she arrived just as matters were working up to the point of an explosion of infection. Without a careful study of the conditions prior to her arrival it is

a simple solution of the question of the origin of the epidemic to assume that the "Niagara" arrived with the epidemic all ready-made on board. This solution, however, does not stand the test of scientific inquiry for the following reasons:—

1. The itinerary of the passengers to and from Europe fails to produce any connection between the New Zealand outbreak and any previous outbreak in other countries. They must have left Britain not later than the 7th September, therefore before the second wave began there, and passed through America between the 12th September and the 24th September. The vessel sailed from Vancouver on the 24th September. We know that the epidemic, even in the eastern States of America and of Canada, did not develop till the end of September, and there was no epidemic at Vancouver or San Francisco when she left there. She left Honolulu on the 1st October, and a few days afterwards the epidemic began on board. Yet the United States Public Health reports show that even by the 18th October very few cases had appeared at Hawaii, and they were very mild in character. During the whole of October only fourteen cases were reported in Honolulu. Where, then, could the "Niagara" have picked up this virulent type of infection? Had it been of the type which visited the transport "Tahiti," or which we met in November, she would not have left America or Honolulu more than a few days before the majority of those on board would have been down with the disease, and a high percentage would have died, and her visit to Fiji would have left a trail of disaster behind her. Yet none of these things happened. Those who advocate the "Niagara" as the source of the epidemic in New Zealand are conveniently silent about the source of the epidemic on the "Niagara."

2. The disease which existed on the "Niagara" on her arrival at Auckland had not the intensity of the epidemic of November, and, indeed, was no more severe than the type which already existed in Auckland on her arrival. Had it been otherwise it would have been impossible for the passengers to have escaped as they did, yet we find that among all classes only ten persons out of 312 had been affected. Out of over one hundred cases amongst the crew only one death had occurred, and that in a man already weakened by other causes. On their arrival in Auckland twenty-nine cases were taken to the Hospital, and of these only two were regarded as pneumonic, and only one of these cases died. Of the nurses who attended the "Niagara" cases one died, but not from pneumonic influenza, but from cerebro-spinal fever. Many nurses were infected in the Auckland Hospital, but with the widespread epidemic already existing there is as much likelihood of their having received their infection from outside as from the "Niagara" patients, and as the wards were soon much crowded with these city cases there is no reason to seek further for conditions sufficient to breed a very acute type of disease in the wards and among the attendants. The medical opinion of the doctors on board at the time of the arrival was that the cases were no more severe than the type already prevalent; and we must assume that the same opinion was held by the medical staff at the Hospital, since no warning was issued that a special virulent type of disease had arisen, and special precautions as regards isolation of the cases and of the nurses were not considered necessary.

3. A careful inquiry into the history of the passengers landing from the "Niagara" failed to reveal any instance in which their stay at hotels and boardinghouses or with friends produced an outburst of influenza. These arrivals scattered all over New Zealand, and had they been carriers of infection would have produced a series of outbursts wherever they went. Yet the outburst took place only in Auckland, and that was a fortnight after the boat arrived.

Evidence, then, fails to convict the "Niagara" as the source of the epidemic. There is, in fact, more reason for thinking that New Zealand gave the severe type of infection to the "Niagara" on her arrival than that the "Niagara" produced the epidemic in New Zealand. It is unfortunate that the situation has been clouded in the public mind by political considerations, which do not favour a dispassionate view of any subject. It must be remembered that this epidemic has appeared with the same element of surprise in all countries, and that the greatest medical authorities in England and America have freely admitted a lack of that omniscience of the sources of the epidemic claimed by some of our local sanitary critics. The specific virus must have been carried to all countries in a form other than a virulent epidemic wave, and doubtless the same thing occurred in New Zealand. During September five vessels from Europe or America arrived in Auckland, and in October there were six. Many of them had on board convalescents from European military hospitals, and among the crew, probably, other potential carriers existed. We know that the mercantile vessels must have spread the disease, and it is significant that the waterside workers of New Zealand, who were naturally in closest touch with the crews of vessels, were the first to show symptoms of alarm as to the developing epidemic. Probably these eleven vessels coming to Auckland all added their quota to the massing infection, the "Niagara" yielding her share with the rest. That October should happen to be a particularly cold and wet month at Auckland, with a rainfall of over 8 in., doubtless added a very powerful influence making for prevalence of catarrhal infection.

We have, then, at Auckland the necessary ingredients for an explosion—a population of susceptible people, more especially Natives in camps and elsewhere, a catarrhal epidemic, and a virus of special potentiality from overseas. The November outburst was the result. The low degree of resistance to pneumonia of the New Zealand troops has been demonstrated in Britain. Their lack of resistance is probably the result of the general healthful condition of life and climate here, whereby our population fails to acquire that natural immunity to disease of the type which the slum dweller derives from constant struggle with invading organisms. It is, doubtless, to this that we owe the very violent character of the outbreak. But we can go further and conclude that to this very violence we owe our present comparative immunity from a recrudescence of the disease such as visited Britain and America in January. Our vaccination may be said to have produced a severe reaction, but it has been effective. It is to be regretted that vaccination of this sort is evanescent in the case of catarrhal infection, and that we cannot hope that our immunity will be indefinitely prolonged.

A report of the work done in the Bacteriological Laboratory, Wellington, follows, being an extract from the annual report of the Government Bacteriologist for the year.

REPORT ON BACTERIOLOGICAL INVESTIGATION OF CASES OF INFLUENZA DURING THE EPIDEMIC, NOVEMBER, 1918

Owing to the whole staff, with the exception of one man, being down with influenza, the investigations carried out were necessarily not as complete as was desirable.

Some Bacteriological Observations made in Wellington in the Influenza Epidemic.

Observations made between the 9th November and the 2nd December, 1918.

Thirty-eight specimens of sputum, 8 of pleural fluid, 6 of empyæma pus, 4 of blood (post mortem), and 2 of cerebro-spinal fluid (both post mortem) were examined culturally; they were obtained from mild, severe, very severe, or moribund cases, or from cadavera.

Sputum.—In mild cases or cases of "ordinary" severity there were observed to be present microscopically large numbers of mixed organisms; among them were usually a small gram-negative bacillus, a streptococcus, a gram-negative diplococcus, a gram-positive capsulated lanceolate diplococcus, and a staphylococcus; in some a gram-positive diphtheroid bacillus and a large gram-negative bacillus were also seen; in a few (three or four) cases Vincent's bacillus and spirillum were found.

Culturally from most of these specimens were isolated the small gram-negative bacillus, the streptococcus, gram-negative diplococcus, and the lanceolate diplococcus; from a few the diphtheriod bacillus, and from one specimen each the bacillus coli and Friedlander's bacillus.

In the more severe and in moribund cases the organisms were not so freely present, and those isolated consisted chiefly of gram-positive, lanceolate, capsulated diplococci and of streptococci and gram-negative diplococci.

The small gram-negative bacillus did not grow in plain agar, nor at room-temperature, but in blood agar at 37° C. It appeared in about forty-eight hours as a very small opalescent colony that did not increase greatly in size on further incubation, but became more distinct. Subcultures even with greatest care usually showed in twelve hours a growth of pneumococci, and the bacillus could not be found, but after twenty-four hours the bacillus was freely present and had quite outgrown the pneumococcus. The young cultures (twenty-four hours) showed a very small immotile bacillus, gram-negative, staining readily with 10-per-cent. Carbo fuchsin. Occasionally a long form, about three or four times the average length was seen. On the very few occasions in which this bacillus was obtained in a state of purity the cultures died out in thirty-six hours, but it could be readily kept alive and subcultured when growing with the pneumococcus.

As already stated, this bacillus was present in all early cases and in cases of ordinary severity, and was the predominant organism; it could be found in every field, and was frequently phagocytized in large numbers; but it was only rarely found in severe or moribund cases.

The streptococcus could be easily isolated and grew well in plain agar. Subcultures showed a pure vigorous growth in sixteen hours; it was of the streptococcus pyogenes class, such as is so frequently isolated from bronchial, pneumoic, catarrhal, or tubercular sputa.

The gram-negative diplococcus was the micrococcus catarrhalis. It was almost always present, and was typical; it was never found alone. Occasionally it was seen to be phagocytized to the exclusion of nearly all the other organisms.

The meningococcus was never found.

The lanceolate diplococcus: This diplococcus appeared in two forms in direct smears made from sputa: (*a*) Small, lanceolate, and capsulated, not occurring in chains; (*b*) large, lanceolate, and capsulated, either singly or in short chains consisting of three to five pairs. It grew only on blood agar, never on plain agar. It fermented (with the production of acid, but not of gas) glucose, saccharose, lactose, raffinose, inulin, maltose, and galactose in Hiss's serum-water. Mannite was not fermented, and there was no reduction of neutral red; litmus milk was acidulated and clotted.

Pleural Fluid and Empyæma Pus from Chest.—In every specimen examined the pneumococcus was present. In thirteen out of the fourteen it was the only organism (in the exception a streptococcus was also isolated).

Blood.—Two specimens taken post mortem were examined. In both the microscopical examination of the direct smears showed a pneumococcus, and the cultures showed vigorous growths in twenty-four hours. In two specimens taken from very severe cases no organism could be found in the direct smears, but light growths of pneumococcal colonies were obtained in twenty-four to twenty-eight hours. (Both these cases died.)

Cerebro-spinal Fluid.—Two specimens from post-mortem cases were examined; both showed much blood and disintegrated corpuscles, but no pus, and the pneumococcus was easily found. The culture-tubes in sixteen hours showed vigorous growths.

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