Applied Epidemiology of Gonorrhea in British Columbia

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MOST HEALTH JURISDICTIONS in North America have substantially reduced morbidity from venereal disease during the past decade. British Columbia has achieved these gains since 1946, when the Province entered the postwar era with the highest rates for gonorrhea and infectious syphilis of any Canadian Province. Since that date the infectious syphilis rate has declined markedly, but the successes achieved in gonorrhea control have been much less spectacular (table 1). Hence, gonorrhea must be considered the major venereal disease problem.

No true measure of the incidence and prevalence of gonorrhea exists. Reporting is notoriously incomplete, and figures based upon morbidity reports can be used only as a partial and minimum indication of both incidence and prevalence and, at most, to evaluate trends rather than to obtain the true picture of the gonorrhea problem.

Trends in morbidity reporting of gonorrhea from 1944 through 1955 for Canada and the continental United States are shown in figure 1. In both countries, following the peak incidence of 1946, case rates declined progressively until 1951; since then, the rates have remained virtually static. These trends may be compared with those for gonorrhea morbidity reporting in British Columbia and adjacent Provinces over the same period (fig. 2). British Columbia participated with other Provincial health jurisdictions in the general decline in gonorrhea incidence which followed the postwar peak of 1946.

The factors contributing to this general decline in gonorrhea incidence may be analogous to those described by Moore (*1*) in connection with the overall decline in the incidence of syphilis. However, it appears unlikely that the immediate postwar decline in gonorrhea was attributable to the application of control measures per se, a conclusion which is borne out by the subsequent stationary or rising trend in the incidence of gonorrhea in most areas.

In British Columbia the postwar decline in gonorrhea incidence ceased as early as 1948, and gonorrhea rates were more or less stationary through 1949 and 1950 (fig. 2), whereas in Canada and the continental United States the decline in gonorrhea incidence continued until 1951. It was concluded that, if further advances were to be made in the control of gonorrhea in British Columbia, the objectives and activities of the control organization would have to be reoriented and new approaches and answers to those apparently refractory problems which were hindering our efforts would have to be devised.

Since 1949, and at an accelerated pace since 1952, a series of studies designed to shed light upon the public health problem presented by gonorrhea and upon the reasons for the relative failure of the control program has been carried on. The objectives of the studies were the elucidation of basic epidemiological information

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Table 1. Number of new cases of venereal disease reported and rate per 100,000 population, British Columbia, 1944–55

Year	Infectious syphilis		Gonorrhea	
	Number cases	Rate per 100,000 population	Number cases	Rate per 100,000 population
1944	380	40. 8	3, 358	360. 3
1945	645	68. 0	3, 711	391. 0
1946	834	83. 2	4, 618	460. 4
1947	575	55. 1	4, 056	388. 6
1948	239	22. 1	3, 608	333. 5
1949	139	12. 5	3, 694	331. 6
1950	61	5. 4	3, 627	319. 0
1951	36	3. 1	3, 336	286. 4
1952	33	2. 7	3, 098	258. 6
1953	26	2. 1	2, 968	241. 3
1954	17	1. 3	2, 668	210. 7
1955	14	1. 1	2, 494	191. 1

SOURCE: Notification of Venereal Infection, form N.H.I., Department of National Health and Welfare, Canada.

regarding this infection and the development of control measures based upon applied epidemiology. The purpose of the present paper is to report upon what has been achieved to date.

Contact Tracing

Comparison of the relative advantages and disadvantages of the three major case-finding activities—education, screening of selected groups, and contact tracing—suggested that effective contact tracing offered the greatest possibilities for a focal attack upon the gonorrhea problem. By this time, the hope that penicillin therapy was so highly specific for gonococcal infection that it was sufficient to treat only known cases and that, with the onset of symptoms, contacts could be relied on to seek medical care had been disproved. Therefore, in 1949 it was decided to develop and improve contact tracing as the strategic epidemiological weapon against gonorrhea.

Prior to 1949, contact tracing had been pushed to the utmost against syphilis, which was considered to be the more serious venereal disease, whereas contact tracing against gonorrhea, although included in the case-finding program, had been haphazard and unorganized. Thus, followup of readily identifiable contacts of gonorrhea cases reported by venereal disease clinics was pushed. Rather less effort was made to ascertain and follow up the contacts of cases reported by private physicians. Little was done to identify the reservoir of infection responsible for perpetuating the disease, and the efficiency and achievement trends of contact tracing were not quantitatively assayed.

From 1949 on, all patients seen at venereal disease clinics were interviewed for contacts. Since many gonorrhea patients were first diagnosed by private physicians, who gave inadequate or no contact information on their morbidity reports, all Provincial health units and other health agencies working in close contact with local private physicians were instructed that every gonorrhea morbidity report, "prior to submission to the division of venereal disease control, should be scrutinized for contact information. Where the attending physician fails to list a minimum of one contact per notified case, the health unit should take steps to see that he is made aware of the importance of his contribution to the overall control program. The modus operandi here should be for the health unit to make an offer of aid (in the elicitation and followup of contacts) so convincingly extended and so helpfully applied as to earn willing acceptance."

Gonorrhea contact indexes (per 100 reported cases) were maintained in order that contact tracing might be quantitated to determine its efficiency and to permit comparative evaluation

Figure 1. Number of gonorrhea cases per 100,000 population, Canada and the United States, 1944–55.

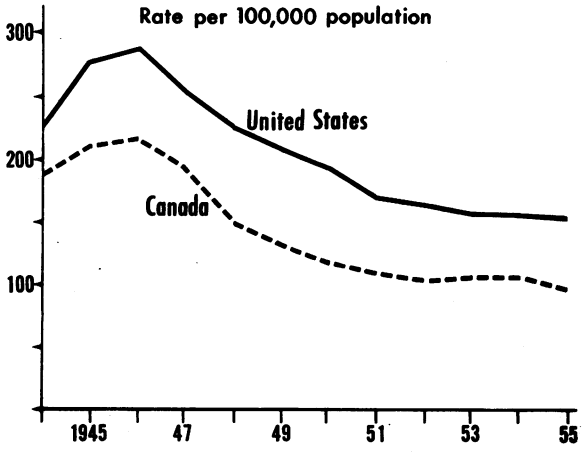
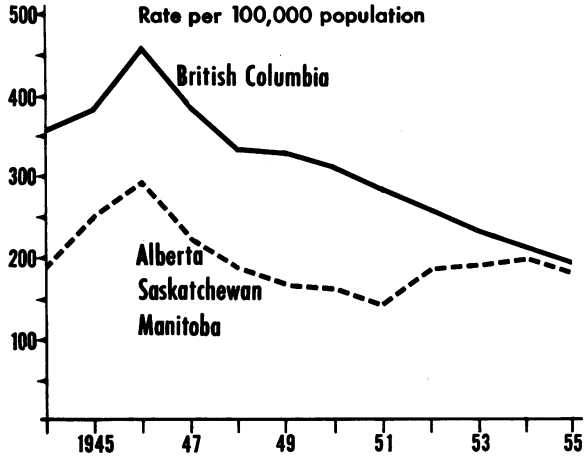


Figure 2. Number of gonorrhea cases per 100,000 population in British Columbia and in Alberta, Saskatchewan, and Manitoba, Canada, 1944–55.



of the contributions made to the program by private physicians and trained epidemiological workers from the venereal disease clinics. Critical reevaluation of the epidemiological data for 1949–53 reveals that these measures, undertaken as part of the intensive contact tracing program, were moderately successful.

Epidemiological Studies

Epidemiological studies made in 1952 and 1953 were perhaps the most important contribution to our understanding of the epidemiology of gonorrhea and were the determining factor in the introduction of selective contact tracing. These studies (*2*) brought out that:

1. One venereal disease patient in every three becomes a repeater.

2. There is an important sex differential in gonorrhea reporting. In 1944–52 the male to female ratio was 2.50 (table 2). This suggests the existence of a reservoir of infected and undiagnosed females and points to the necessity for increased case-finding efforts among women. In 1952, 12.7 percent of all women examined at the Vancouver Gaol Examination Centre had untreated gonorrhea.

3. A successful epidemiological attack upon gonorrhea involves recognition of the fact that the reservoir of infection is made up of female patients, most of whom are unidentified, and that the objective of epidemiology is to bring the infected woman to treatment before she can infect a third person. This means that the female with undiagnosed gonorrhea must be identified through her recent male contact and be brought to treatment within hours.

A focal attack upon this reservoir of gonorrhea was incorporated in a four-point "speed-zone" project instituted by the division of venereal disease control in August 1953. The objectives of this project were:

1. To interview all male gonorrhea patients for information regarding their female contacts during the 6-day period preceding onset of symptoms. It was believed that the male patient could be used as a signpost leading to an infected female contact or to a potential carrier. Efforts were concentrated upon female contacts of known infected males in the belief that infected male contacts of known infected females would come to treatment voluntarily.

2. To locate identifiable female contacts within a matter of hours in order to minimize numerical opportunities for dissemination of infection.

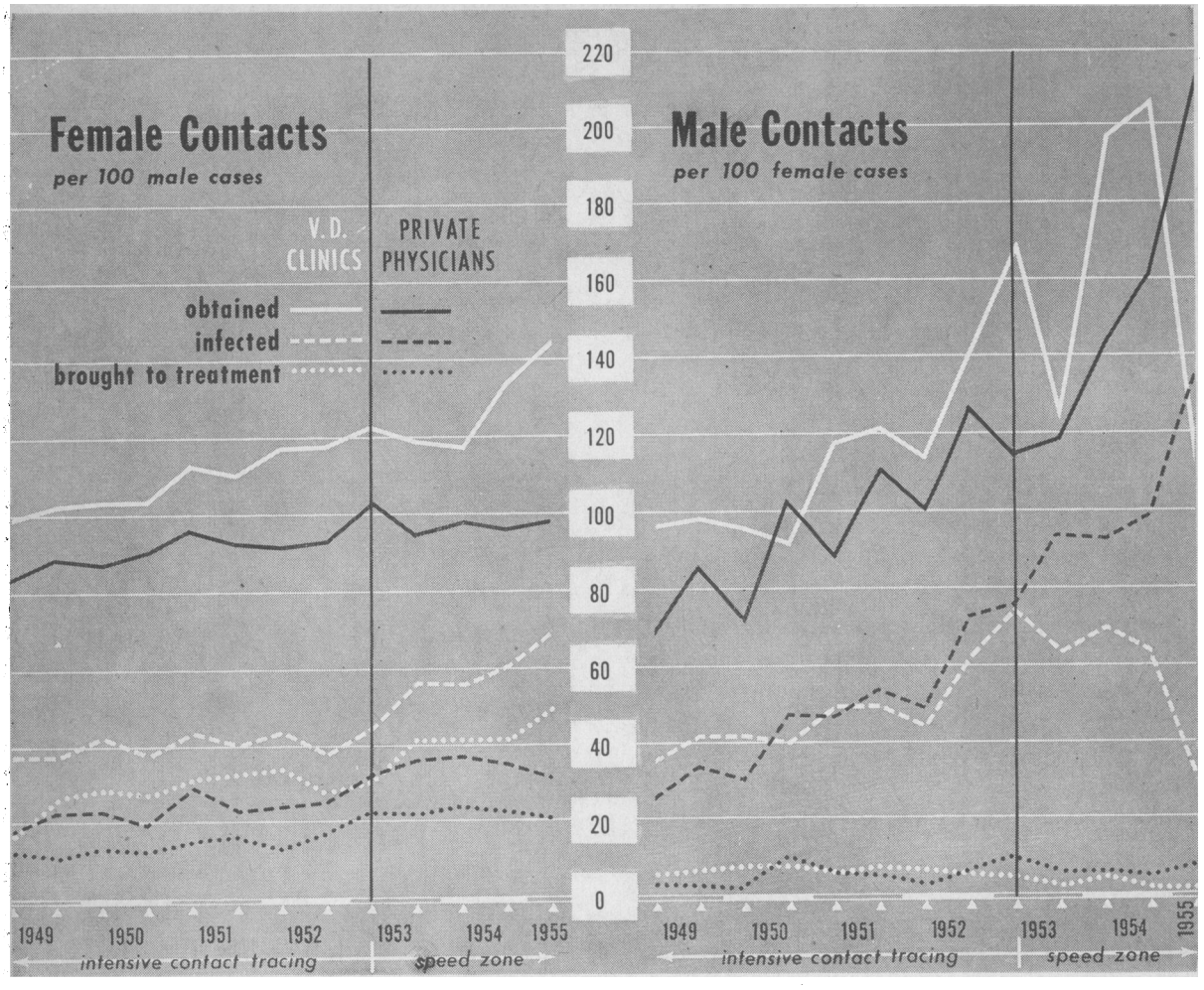
3. To treat female contacts immediately as suspect carriers, although, when practicable, urethral and cervical smears and cultures were to be taken before treatment. This procedure appeared justifiable because it is difficult at any time to make a bacteriological diagnosis of gonorrhea in women and even more difficult to

Table 2. New cases of gonorrhea reported, by sex, British Columbia, 1944–52

Year	Number of cases			Male/female ratio
	Total	Male	Female	
1944	3, 358	2, 460	898	2. 74
1945	3, 711	2, 682	1, 029	2. 61
1946	4, 618	3, 244	1, 374	2. 36
1947	4, 056	2, 925	1, 131	2. 59
1948	3, 608	2, 575	1, 033	2. 49
1949	3, 694	2, 513	1, 181	2. 13
1950	3, 627	2, 428	1, 199	2. 03
1951	3, 336	2, 461	875	2. 81
1952	3, 098	2, 352	746	3. 15
Total	33, 106	23, 640	9, 466	2. 50

SOURCE: Notification of Venereal Infection, form N.H.I., Department of National Health and Welfare, Canada.

Figure 3. Semiannual gonorrhea contact, epidemiological, and brought-to-treatment indexes, by sex, British Columbia, 1949–55.



determine that a given woman is free of infection.

4. To control community conditions facilitating the acquisition and spread of venereal disease, which was considered to be just as important in an epidemiological program of this nature as it was formerly.

Evaluation techniques were devised by developing achievement indexes, to determine whether the first two objectives were being met.

Since interviewing male patients for information regarding their significant female contacts is the crux of selective contact tracing, the contact, epidemiological, and brought-to-treatment indexes of Iskrant and Kahn (*3*) were used, on a semiannual sex-specific basis, for evaluation of gonorrhea contact tracing. More specifically, the sex-specific brought-to-treatment index obtained from the followup of female contacts of male patients was regarded as the critical index of achievement in selective contact tracing.

Because the value of specialized contact investigation would probably be in direct proportion to the length of time by which the infectious period was shortened, followup studies were instituted to measure the elapsed time between naming of contacts and date of treatment of such contacts.

By using these techniques, the achievements of gonorrhea contact tracing during both the 5-year intensive contact-tracing period (January 1, 1949, through June 30, 1953) and the 3-year speed-zone period (July 1, 1953, through June 30, 1955) could be evaluated and contributions to the program by private physicians and

by trained epidemiological workers from the venereal disease clinics could be compared (fig. 3). In the material which follows, all achievement indexes are based upon 100 reported cases of gonorrhea in either sex. For example, the contact indexes for males measure the number of female contacts obtained by interviewing 100 male gonorrhea patients.

Although field investigation of male contacts to female gonorrhea patients was not considered worth while because of the belief that infected male contacts would come to treatment of their own accord, it was felt that useful information could be obtained by matching records. The semiannual achievement indexes in the right-hand column of figure 3 indicate that most infected male contacts come to treatment voluntarily and that, as measured by the brought-to-treatment indexes, contact tracing, per se, is not and never has been a productive method of finding cases of gonorrhea in males.

A progressive and marked increase in the female contact index obtained by private physicians occurred during both the intensive contact-tracing and the speed-zone periods. Private physicians are in a position to obtain information from females regarding their male contacts. Although this information will not increase the discovery of new cases of gonorrhea in males, it may be assumed that private physicians could effect a like improvement in the male contact index by questioning male patients regarding their female contacts.

The critical indexes are those which measure the results of investigation of female contacts of male patients and should reflect both effort and achievement in reducing the reservoir of gonorrhea infection among females. The data in the left-hand column of figure 3 indicate that, over the entire period 1949–55, clinic epidemiological workers increased their contact index for males from 99 to 143. Private physicians improved their contact index from 84 to 103 during the intensive contact-tracing period but were unable to effect any further improvement and have not been able to maintain this critical index above 100 (1 female contact per reported male patient).

Similar trends are apparent in the corresponding epidemiological indexes. Clinic workers increased their epidemiological index for males from 37 to 44 (19 percent) during the intensive contact-tracing period and, with the advent of selective contact tracing, further improved this index to a high of 69 (57 percent). The trend of the epidemiological index for private physicians followed the trend of their contact index, an early and marked increase in the epidemiological index from 19 to 33 (74 percent) during the intensive contact-tracing period being followed by a more or less stationary trend.

Results

In terms of ultimate achievement, as measured by the male brought-to-treatment indexes, during the intensive contact-tracing period the clinic epidemiologists almost doubled the number of new cases of gonorrhea discovered in females as compared with the number discovered during early 1949 and subsequently trebled this number in the speed-zone period. The pattern of the brought-to-treatment index for private physicians approximates the pattern of their contact and epidemiological indexes, with an increased yield of new cases among females during the intensive contact-tracing period followed by a period during which no further improvement was made.

Table 3. Cumulative percentage distribution of new cases of gonorrhea among females brought to treatment through contact investigation, according to time taken to bring under treatment by clinics of the division of venereal disease control, British Columbia, July 1, 1952–December 31, 1954

Time between being named as contact and treatment (days)	Control period		Speed-zone period	
	Number of cases	Cumulative percentage	Number of cases	Cumulative percentage
Less than:				
1	10	3. 73	38	8. 30
2	27	10. 07	86	18. 78
4	52	19. 40	140	30. 57
8	95	35. 45	225	49. 13
15	145	54. 11	311	67. 91
31	207	77. 24	385	84. 07
91	249	92. 91	448	93. 82
365	268	100. 00	458	100. 00

Table 4. Number of new cases of gonorrhea among females brought to treatment through contact investigation, according to time taken to bring under treatment by clinics of the division of venereal disease control, British Columbia, July 1, 1952–December 31, 1954

Time between being named as contact and treatment (days)	Number of cases brought to treatment		
	Control period	Speed zone period	Total
Less than 1	10	38	48
1	17	48	65
2–3	25	54	79
4 or more	216	318	534
Total	268	458	726

By means of these sex-specific contact, epidemiological, and brought-to-treatment indexes, it has been possible to analyze in some detail our data for the period 1949–55 and to demonstrate improvement in the accomplishments of contact investigation in gonorrhea control. However, there is considerable room for improvement in the contributions which might be made by both clinic epidemiologists and private physicians in particular toward the whole program.

Contact investigation in gonorrhea control is not being exploited to the utmost unless and until private physicians (*a*) are thoroughly indoctrinated with the potential importance of their contribution to contact tracing, (*b*) are made aware of the importance of the undiagnosed reservoir of gonorrhea in females, and (*c*) acquire new attitudes and skills in interviewing male gonorrhea patients for female contacts. The increasing importance of the private physician's role in gonorrhea control is also evident from the fact that whereas in 1949 private physicians submitted 36.6 percent, clinics, 60.6 percent, and other agencies, 2.8 percent of all morbidity reports, by 1955 these figures were 45.2 percent, 35.5 percent, and 19.3 percent, respectively.

It is important to locate all female contacts within a matter of hours of identification in order to minimize numerical opportunities for dissemination of infection. Therefore, it is useful to know not only the contact index but also the elapsed time between the identification of the female contact and her examination and treatment. Indeed, the success or failure of the speed-zone project must be gauged by the rapidity with which infected females are brought to treatment, thus shortening the infectious period.

In order to determine whether a significantly larger number of infected female contacts were brought to treatment earlier by speed-zone techniques than by conventional contact tracing, a special study was made on clinic patients only. The numbers of new cases of gonorrhea in females brought to treatment through contact investigation during the 13 months July 1, 1952, through July 31, 1953, the latter part of the intensive contact tracing period, with the time lapse in days between identification as a contact and treatment, were compared with the numbers brought to treatment during the 17 months August 1, 1953, through December 31, 1954, the early part of the speed-zone period. The relevant data are given in tables 3 and 4.

During the speed-zone period, approximately 19 percent of all females brought to treatment were treated within 48 hours after they were named as contacts; 30 percent were treated within 4 days; and 84 percent within 1 month (table 3). The corresponding figures for the control period were 10 percent, 19 percent, and 77 percent, respectively. Statistical treatment of the data in table 4 indicates that introduction of speed-zone epidemiological techniques into the clinics of the division of venereal disease control in British Columbia was effective in significantly reducing the time between being named as a contact and treatment of female gonorrhea patients brought to treatment through contact investigation. This, in the final analysis, decreased the chances of the promiscuous male population acquiring gonorrheal infection.

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