

GONORRHOEA SITUATION IN SOUTH GREENLAND IN THE SUMMER OF 1964*

BY

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Greenland is the largest island in the world, situated north-east of the North American continent (Fig. 1). Its length from north to south is 2,700 km. and its width from east to west 1,050 km., the total area being 2,175,600 sq. km. Of this total area 84 per cent. is covered with an ice cap, called the inland ice, the ice-free areas along the coast making up only about 341,700 sq. km. The country is typically mountainous, with very few flat stretches. The coast is bordered by skerries and indented by many deep fiords which often stretch right to the inland ice.

Greenland is part of the Kingdom of Denmark, but has quite extensive home rule. This large country is inhabited by only 35,000 people, most of whom

live in small towns of 1,000 to 3,000 inhabitants, with a hospital, school, power station, telegraph station, and major or minor industrial plants. In recent years, these small towns have begun to develop into modern urban communities on a Western European pattern, but to this day 43 per cent. of the population live in small, isolated communities. Owing to the enormous distances and the difficult communications, many of these trading stations and settlements are not visited by a doctor as often as would be desirable. The doctor often has to travel for days by boat or dog sledge to visit his vast medical district. Therefore, the daily supervision of the population in these distant places is left to a Greenlandic midwife with very moderate theoretical and practical education.

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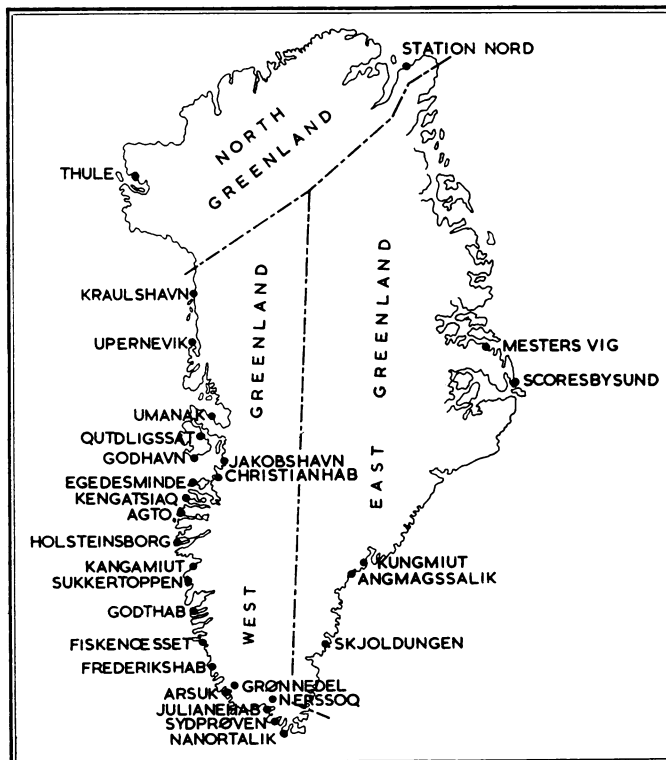


FIG. 1.—Map of Greenland.

The original population of Greenland consisted of Eskimos, but to-day a pure Eskimo is rare, almost the entire population bearing the marks of the presence of Danes since 1605.

Traditionally, the Greenlandic population's views on sexual relations are extremely free (von Osten, 1789; Bertelsen, 1935; Marcussen and Rendal, 1951).

Gonorrhoea is a comparatively new disease in Greenland. The first case was diagnosed in 1864 (Lange, 1864), but since 1913 the disease has been spreading rapidly (Folke, 1935). In recent years, the increase has been explosive, the number of cases having doubled between 1955 and 1962 (Bøggild, 1965). Merely from 1961 to 1962 there was an increase of not less than 43 per cent. in the notified cases (Fig. 2).



Fig. 2.—Annual number of recorded cases of gonorrhoea in Greenland, 1955–62.

In 1962, 4,000 cases of gonorrhoea were recorded in the population of 35,000. This gives quite a sombre picture of the conditions. In Denmark proper, *i.e.* in a population of 4.5 millions, the annual number of diagnosed cases is only twice that in the small Greenlandic population. Moreover, there is no record of the incidence of gonorrhoea among the inhabitants of the trading stations who, as already mentioned, make up 43 per cent. of the total population.

The situation became critical in 1962 when treatment failures were experienced in 27 per cent. of cases, and it has been ascertained that 86 per cent. of the gonococcal strains showed reduced sensitivity to penicillin (Bøggild, 1965). The development of so many gonococcal strains with reduced sensitivity to penicillin is presumably due to the fact that at the time treatment took the form of a single dose of 2.4 million units of the preparation Penilente Novo forte, containing 600,000 units sodium penicillin, 600,000 units procaine penicillin, and 1.2 million units benzathine penicillin. This gives a high initial con-

centration of penicillin and maintains a long-lasting, but low concentration (Perdrup, 1961). This latter fact increases the risk of selection of penicillin-resistant strains.

Even after the treatment was changed to procaine penicillin, 1.2 million units daily for 3 days, failures still occurred in 28 per cent. of cases.

Present Investigations

At the request of the Ministry for Greenland and the National Health Service, we conducted a pilot study of the gonorrhoea situation in the three southernmost medical districts of Greenland in the summer of 1964. This area is populated by approximately 6,500 people. The investigation was assisted by a gonococcus laboratory from the Serum Institute in Copenhagen. The study was conducted on the basis of epidemiological surveys with meticulous tracing of contacts.

In the course of 2½ months we investigated 1,083 persons for venereal and dermatological diseases and detected 228 cases of gonorrhoea. The gonococcus laboratory examined a total of 2,510 culture specimens.

In order to obtain material from the trading stations, the local midwives were instructed in taking specimens for culture from the urethra of males as well as females. Special iceboxes and thermocontainers were procured for the storage and transport of the tubes containing the culture medium (Fig. 3, opposite).

All who applied to the midwife were treated immediately with penicillin, without waiting for the result of the bacteriological investigations. The same applied to the patients' contacts. This system functioned satisfactorily during the period of the study.

Findings

On the basis of these investigations it may be estimated that the annual incidence of gonorrhoea in Greenland must be around 20 per cent., being highest (40 per cent.) in the southernmost district. Massive infection was also found among the population of the trading stations, the findings indicating an annual incidence of approximately 30 per cent.

Owing to the need to record the material before the authors left Greenland on September 1, the analysis includes only the first 142 patients who were started on treatment in the two northernmost medical districts before August 15th.

Sex Ratio.—These 142 patients comprised seventy males and 72 females—a strikingly equal sex ratio. Statistics from other countries usually show a considerable preponderance of males. In Denmark, for instance, twice as many cases are recorded among

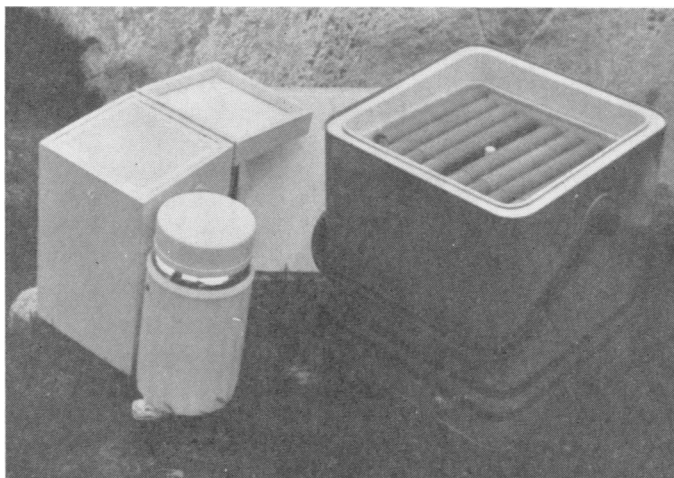


FIG. 3.—Thermocontainer for transport and icebox for storage of tubes with culture medium.

males—according to some authors even four times as many—as among females (WHO Expert Committee, 1963). The equal sex ratio in the present series indicates that the tracing of contacts has been quite effective.

Age Distribution.—83 per cent. of the males and 86 per cent. of the females were between 15 and 29 years of age (Table I).

TABLE I
AGE DISTRIBUTION OF GREENLANDERS AND DANES

Country	Age Group (yrs)	Sex			
		Male		Female	
		No.	Per cent.	No.	Per cent.
Greenland	Under 15	0		1	
	15-19	18	30 } 83	29	41 } 86
	20-24	23		26	
	25-29	8	14	5	7
	Total	59		71	
Denmark	30-34	6	17	6	14
	35-44	1		2	
	45-	3		2	
	20-24	7			
	25-29	2			
30-34	2				
Total	11				

Marital Status.—It is evident from Table II that the majority of the patients were single, married patients being exceptional.

Previous History (Table III).—Among the Greenlandic patients with gonorrhoea, 8 per cent. of the males and 10 per cent. of the females stated that they had not previously had gonorrhoea. After omitting the patients whose history was unknown (almost

TABLE II
MARITAL STATUS OF GREENLANDERS AND DANES

Country	Marital Status	Sex	
		Male	Female
Greenland	Single ..	50	63
	Married ..	5	7
	Not Known	4	1
	Total ..	59	71
Denmark	Single ..	9	—
	Married ..	2	—
	Total ..	11	—

exclusively patients in whom the diagnosis was based on a positive result of a specimen sent in by the local midwife who did not report on this point) 49 per cent. of the males and 68 per cent. of the females reported having had three or more previous attacks of gonorrhoea.

TABLE III
PREVIOUS INFECTION WITH GONORRHOEA

Number of Previous Infections with Gonorrhoea	Greenlanders				Danish Males
	Males		Females		
	No.	Per cent.	No.	Per cent.	
0	5	8	7	10	7
1	7	21	5	13	2
2	14		8		18
3-4	11	25	27	42	1
5-6	6		7		0
7-8	2		7		0
9-10	4		1		0
11+	2		0		0
Not Known	8	14	9	13	1
Total ..	59	100	71	100	11

Time of Last Infection with Gonorrhoea (Table IV).—The great majority of patients had had repeated recurrences of gonorrhoea during the past few years.

TABLE IV
DATE OF LAST INFECTION WITH GONORRHOEA

Sex	Percentage	Date of Infection
Male	17.4	Before 1961
	2.2	1961
	8.7	1962
	30.4	1963
	41.3	1964
	33.0	After April 1, 1964
Female	10.9	Before 1961
	5.5	1961
	3.6	1962
	20.0	1963
	60.0	1964
	40.0	After April 1, 1964

Tracing of Contacts.—Meticulous tracing of contacts is of fundamental significance for confining and fighting venereal diseases in a given area (Marcussen and Rendal, 1951; Rahbek, 1962). From the very outset, we attached great importance to this aspect of the study. The number of different contacts admitted within approximately the previous 3 weeks is shown in Fig. 4. Men reported an average of 1.9 contacts and women an average of 2.7, and we succeeded in examining 1.5 contacts per male patient and 2.1 contacts per female patient. Thus, 79 per cent. of the contacts reported by the males and 76 per cent. of those reported by the females were examined by the team.

Gonorrhoea was found in 69 per cent. of the contacts of the males and 57 per cent. of those of the females. Converted to total reported contacts, gonorrhoea was demonstrated in 55 per cent. of the contacts of males and 43 per cent. of those of females.

Reason for Investigation (Table V).—This aspect of the study clearly displays the necessity of careful contact tracing. Only one of the 72 female patients with gonorrhoea presented herself on her own initiative, and 45 were found as contacts of male patients in whom gonorrhoea had been diagnosed.

TABLE V
REASON FOR EXAMINATION

Reason for Examination	Sex		
	Male	Female	Total
Reported as contact	20	45	65
Presented of own accord . .	34	1	35
Re-infection	6	2	8
Recurrence after treatment elsewhere	2	2	4
"G-day"	7	20	27
Rape or attempted rape, incest	1	1	2
Routine examination <i>post partum</i>	0	1	1
Total	70	72	142

Efforts were made to follow up all patients by obtaining specimens for culture three times at weekly intervals before finally discharging them. One of these follow-up studies was arranged so that all patients from the past months were asked to present themselves for investigation on the same day—the so-called "G day"—and on this day all the patients were given extra treatment. The motivation for this extra treatment was that on one single day we wanted to make sure that a given portion of the "hard core" had been cured of the disease. The concept "G day", however, comprises also the initial, broadly-planned follow-up and treatment of all patients treated for gonorrhoea within the 4 months before the start of the investigation. This extraordinary follow-up disclosed a total of 32 cases within the entire period of the study.

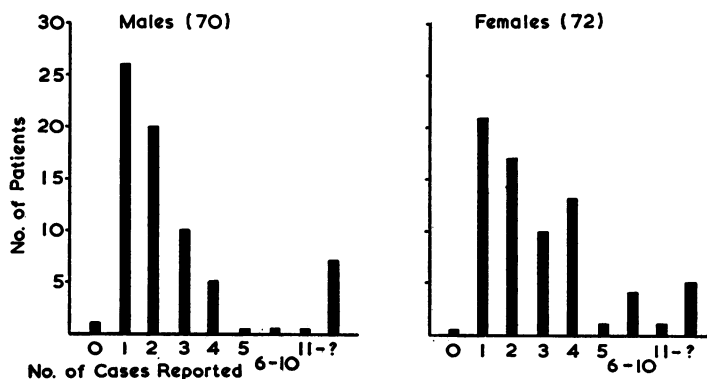


FIG. 4.—Number of different contacts reported by 70 males and 72 females within approximately the previous 3 weeks. ? = number of contacts not known—almost exclusively patients from trading stations examined by midwives.

Sensitivity Determinations.—Sensitivity tests to penicillin, tetracycline, and streptomycin were carried out on 152 gonococcal strains, 47 per cent. of them showed reduced sensitivity to penicillin (Fig. 5), whereas only 9 per cent. showed reduced sensitivity to tetracycline (Fig. 6); 15 per cent. of the tested strains were resistant to streptomycin (Table VI). This distribution is very different from that found by Bøggild (1965) in Godthåb (Greenland) and by Schmidt (1962) in Copenhagen (Denmark).

TABLE VI
SENSITIVITY OF 152 GONOCOCCAL STRAINS TO STREPTOMYCIN

Sensitivity	Strains	
	No.	Per cent.
Resistant (≤ 25 $\mu\text{g./ml.}$) ..	26	15
Sensitive (≥ 25 $\mu\text{g./ml.}$) ..	126	85

Bøggild, Godthåb (1962) 57 per cent. resistant
Schmidt, Copenhagen (1960-61) 9 per cent. resistant

Gonococcal Complement-fixation Test.—This was positive in 31 per cent. of the patients so investigated. Positive reactions were considerably more common in the trading stations than in the towns, presumably because patients from the trading stations harbour their infection longer before being treated and some have probably been treated insufficiently by the midwives.

Complications.—There was a striking paucity of complications (only one case of prostatitis, two of salpingitis, one of epididymitis, and three of gonorrhoeal arthritis). It must be emphasized, however, that it was not possible to employ bidigital palpation

systematically. Gisslén, Hellgren, and Starck (1961) in Gothenburg, Sweden, found gonorrhoeal salpingitis in 10 per cent. of their female patients with gonorrhoea and sterility in 2 to 3 per cent. In Great Britain, Rees (1964) has demonstrated an increasing incidence of gonorrhoeal salpingitis, reaching 11.6 per cent. in 1962. In a population like that of Greenland, a considerable number of severe complications would have been expected, but the actual figures are amazingly low.

Pregnancies.—Gonorrhoea was diagnosed by culture in six pregnant women, one of them 6 months and three 8 months pregnant. Furthermore, gonorrhoea was demonstrated in one woman by routine culture immediately *post partum*. It is comforting to know that Crédé's prophylactic instillation of silver nitrate is carried out routinely in Greenland.

Treatment

As treatment with benzathine penicillin in a single dose as well as with procaine penicillin for three consecutive days had failed, preliminary studies on combined treatment with probenecid and sodium benzyl penicillin were performed in collaboration with Schmidt and Roholt (1965) before the authors' departure for Greenland. These experiments had shown blood levels of penicillin which might be presumed to cover a penicillin resistance pattern like that demonstrated by Bøggild (1965). Previously, Jensen, Kvorning, and Nørredam (1962) had reported that such combined treatment was effective in gonorrhoea resistant to penicillin.

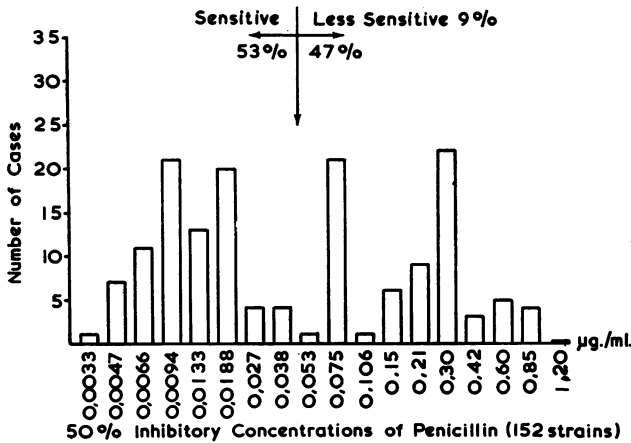


FIG. 5.—Sensitivity of 152 gonococcal strains to penicillin.

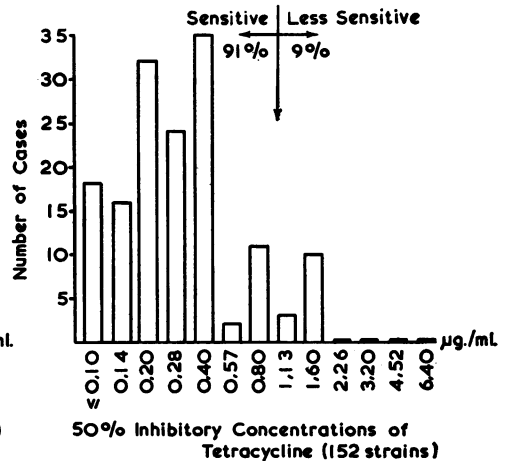


FIG. 6.—Sensitivity of 152 gonococcal strains to tetracycline.

It was decided, therefore, to introduce a standard treatment consisting of 1 g. probenecid, followed after half an hour by an intramuscular injection of 5 million units sodium benzyl penicillin dissolved in 8 ml. 0.5 per cent. lidocaine. Lidocaine was used as a solvent in order to eliminate the quite severe pain caused by the injection of such a large dose of penicillin into the tissue.

Therapeutic Results.—This treatment was very efficacious; there was only one recurrence and eight re-infections. In distinguishing between recurrence and re-infection, we stressed the three following points:

- (1) Whether negative cultures had been obtained in the interim;
- (2) Whether sexual intercourse had taken place with a person having presumed or definite gonorrhoea prior to this exposure to risk;
- (3) Repeated determinations of sensitivity to penicillin, tetracycline, and streptomycin.

All eight cases of re-infection fulfil at least two of these requirements.

Side - Effects.—From 400 to 500 injections of penicillin were given, and only four persons developed urticaria of a maximum duration of one day. No other side-effects were recorded.

The Trading Stations

In order to elucidate the conditions among the population of the trading stations, a *total* investigation was conducted of all adults present at two trading stations, a total of 309 persons (Lomholt and Berg, 1965). Among the important findings were the following:

40 per cent. of male as well as female Greenlanders reported having had gonorrhoea three or more times. 28 per cent. of single men and 27 per cent. of the women had been treated for gonorrhoea within the past 6 months. Among 52 women in the age range 16 to 29 years, only five had not previously had gonorrhoea.

Suggestions for Future Measures against Gonorrhoea in Greenland

On the basis of the above study, Lomholt (1965) has submitted the following suggestions to the Greenland National Council, the Ministry for Greenland, and the National Health Service:

All patients treated for gonorrhoea within the past 6 months should be requested to present themselves on the same day throughout the country for after-treatment. This would make it possible to eradicate, on the same day, the "hard core" from which the disease is being maintained. Since in the trading stations there is no reliable information as to who has previously had gonorrhoea and as in these

localities the disease is very widespread, it is suggested that all single persons in the age range 16 to 29 years should have the treatment.

Such an extraordinary investigation and treatment would have to be repeated at 6-monthly intervals, if the high incidence of gonorrhoea among the Greenlanders is to be permanently reduced. Lomholt suggested that this programme be introduced as a preliminary measure for 18 to 24 months.

The risk of carrying through such an extraordinary treatment is slight, not exceeding that of the continued individual treatment of the cases.

The proposal does not appear to be an unreasonable encroachment on a group of young people who continue to present themselves with re-infection—often several times in a year. This group of the population must also be the one for which it is most important to reduce the risk of gonorrhoeal infection. To the remaining part of the population the situation is intolerable.

In early October, 1964, the Greenland National Council unanimously carried a proposal on these lines.

The reason why this proposal could be advanced in August 1964 is that, unlike other arctic areas (Smith, 1868; Gückel, 1927; Barnett, Fields, Milles, Silverstein, and Bernstein, 1947), Greenland has so far been spared infection with syphilis. There have been only a few sporadic cases, transmitted by visitors and each time the disease has been located and eliminated by energetic measures on the part of the health authorities (Fanøe, 1877; Helms, 1894; Marcussen and Rendal, 1950). But after the proposal was put forward, an epidemic of syphilis broke out in South Greenland, and Lomholt and Kvorning spent 6 weeks in Greenland, trying to elucidate the extent of the epidemic by investigating the whole population in the threatened area. It is hoped that this epidemic will be suppressed, and that thereafter the proposed scheme for eliminating gonorrhoea can be carried out according to the lines sketched above.

Summary

A pilot study on the incidence of gonorrhoea in the Greenlandic population is reported. The study was conducted on the basis of epidemiological surveys. According to the findings the annual incidence is estimated to be approximately 20 per cent, but in one area it was as high as 40 per cent. The disease affects mainly single persons in the age range 15 to 29 years. Among the persons with gonorrhoea 49 per cent. of the males and 68 per cent. of the females had a history of 3 or more previous attacks. The numbers of male and female cases were equal. Within the previous 3 weeks the females reported 2.7

and the males 1.9 contacts. The importance of carefully tracing contacts is emphasized, since only one of the female patients presented herself spontaneously; all the others were found by tracing contacts and by following up patients with a history of gonorrhoea. An account is given of the principles of the extraordinary examination and treatment programme, called "G day". Complications appear to be strikingly uncommon. The sexual habits of the Greenlanders are analysed.

The sensitivity of 152 gonococcal strains to penicillin, tetracycline, and streptomycin was tested. As a high resistance to the ordinary treatment with benzathine penicillin and procaine penicillin in mega doses had been demonstrated, treatment with probenecid combined with sodium benzyl penicillin was tried. The effect of this treatment proved favourable, with only one recurrence among 228 treated cases.

A plan for reducing the very high incidence of gonorrhoea among Greenlanders is outlined. This plan, which has a purely epidemiological aim, has been adopted by the Greenland National Council and will presumably be carried into effect in the near future.

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L'état de la blennorrhagie dans le sud du Groenland pendant l'été de 1964

RÉSUMÉ

Une enquête spéciale à propos de l'incidence de la blennorrhagie chez les Groenlandais est présentée. L'enquête a été menée selon les relevés épidémiologiques. Selon ces constatations l'incidence annuelle est estimée à 20% à peu près, mais dans une région elle a même atteint 40%. Cette maladie attaque principalement les célibataires âgés de 15 à 29 ans. Parmi les personnes atteintes de la blennorrhagie, 49% des hommes et 68% des femmes ont indiqué un passé révélant trois ou plusieurs attaques. Le nombre de cas chez les hommes et les femmes a été le même. Pendant les trois semaines précédentes les femmes ont dévoilé 2,7 contacts et les hommes 1,9. L'importance de dépister avec soin les contacts est soulignée parce qu'une seule femme s'est présentée volontairement, toutes les autres ont été retracées en dépistant les contacts ou en questionnant ceux affectés par la maladie. Un aperçu appelé "Jour G" est donné des principes employés pour l'examen et le traitement détaillés. Les complications semblent d'une rareté surprenante. La sexualité des Groenlandais est analysée.

L'effet de la pénicilline, de la tétracycline et de la streptomycine sur 152 différentes souches de gonocoques a été testé. Comme une forte résistance a été démontrée après le traitement routinier avec la procaine-pénicilline et la benzathine-pénicilline en doses de 1,000,000 unités, le traitement avec la probénécide combinée à la benzyl-pénicilline sodique a été essayé. L'effet de ce traitement s'est montré favorable, une seule récurrence ayant été constatée sur 228 cas traités.

Un plan pour la réduction de l'incidence très élevée de la blennorrhagie chez les Groenlandais est esquissé. Ce plan qui n'a qu'un but épidémiologique a été adopté par le Conseil National du Groenland et sera probablement mis en vigueur dans un avenir prochain.