

cer of the breast. It is astonishing, it seems to me, that such can be the fact, for especially in cases of cancer of the breast the standard operation involving the removal of the breast with all the skin over it, the pectoral muscles, the entire axillary contents and the deep fascia of the chest wall from clavicle to epigastrium and from sternum to Latissimus, is or should be a matter of common surgical knowledge. It is difficult to comprehend the mental attitude of a surgeon who performs any operation short of the standard operation in an early and favorable case of cancer of the breast, and thus deprives his patient of the opportunity for cure to which she is entitled by reason of the advances that have been made in surgical treatment.

With regard to radiation also it must be admitted that there is room for improvement both in the technique of the application of radium and X-ray, and to a far greater extent in the judgment employed in the selection of cases suitable for treatment by these agents. Time and space will not permit a detailed discussion of these points, but to anyone who deals with cancer cases in their later stages it is all too frequently made evident that the treatment obtained by the cancer patient during the early and

favorable stages of the disease falls short of the best that could be given even at the present time.

The value of the colloidal metals, copper, gold and especially and more recently, lead, in the treatment of cancer is still under discussion. Conflicting reports are obtained from many sources, and at the present moment one can only say that the value of these methods is open to considerable doubt and their use is attended by dangers which can not at present be entirely avoided.

To summarize the burden of this communication, it may be said:

The deaths from cancer are increasing year by year. No specific cause or remedy for the disease has yet been discovered. With our present methods of treatment, surgery and radiation, cures can be obtained in early and favorable cases. If all cases could be given treatment in the early and favorable stage of the disease some *five times as many cures* of cancer could be obtained as are obtained today. To obtain this end the public and the medical profession must be taught that in its early stages cancer is essentially an acute disease, but one which is in many cases amenable to cure by prompt, radical and efficient treatment by surgery or by radiation.

## CANCER STUDIES IN MASSACHUSETTS. 2. HABITS, CHARACTERISTICS AND ENVIRONMENT OF INDIVIDUALS WITH AND WITHOUT CANCER

BY HERBERT L. LOMBARD, M.D., AND CARL R. DOERING, M.D.\*†

AT the inception of the Massachusetts program for cancer control Dr. Frederick Hoffman was consulted for suggestions. He advised that the Massachusetts study should include a collection of questionnaires similar to those that he was collecting in his San Francisco Survey<sup>1</sup>. As Dr. Hoffman is probably the greatest collector of figures of our time, any advice from him should be most seriously considered. A few of these questionnaires were obtained in the 1925 study<sup>2</sup> but as the number was too small for tabulation they were given to Dr. Hoffman to incorporate with his other records.

During 1927 a somewhat similar study was made by this Department, with the assistance of several of the visiting nurses' organizations throughout the State. Our method of approach was somewhat different from that of Dr. Hoffman. We feel that any study of the habits of individuals with cancer is of little value without a similar study of individuals without cancer. To know that a large percentage of patients with cancer have certain habits is of little value for inference unless we know what percentage of the community at large has the same habits.

In the laboratory it may be fairly easy to

obtain animals which may be used as controls, but in dealing with the human species this is an entirely different problem.

**METHODS:**—Our controls were obtained by having the same investigator who collected the record of the patients with cancer fill out a similar record for an individual without cancer, of the same sex and approximately the same age. In a few cases it was necessary for a different investigator to obtain a control.

The following information was obtained:

Name	Address		
Sex	Age	Race	Conjugal state
Birthplace of individual	Of father	Of mother	
No. of children	Height	Weight	
Average amount of exercise before illness			
Length of intimate association with cancer patients			
Foods eaten prior to illness:			
Meat, Sugar, Starches, Canned goods, Green vegetables, Other vegetables, Milk products, Coffee, Tea, Salt			
Use of tobacco			
Use of alcohol			
Use of laxatives			
Housing conditions			
Economic status			
Chronic past illness			
Type of cancer			

These items are intended to cover most of the present hypotheses regarding the causation of cancer.

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†For records and addresses of authors see "This Week's Issue," page 524.

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We obtained records from 217 cancer patients and a similar number of controls. While the number is small, it is felt to be sufficiently large to make a preliminary statement of our findings. Sometimes large differences will show up in small samples, and only such differences are of value in a program of cancer control.

**EVALUATION OF SAMPLE:**—The groups contain 55 males and 162 females. The sex ratio of 34 males to 100 females is less than that found in the cancer mortality records, 65 males to 100 females, and the clinic attendance of 80 males to 100 females. This difference probably means that many men with cancer are cared for by their wives, but when the women are affected the visiting nursing associations are employed. The average age of the cancer patient is  $59.2 \pm .9$  years, and the standard deviation is 12.9. The controls have an average age of  $59.5 \pm .8$  years, and the standard deviation is 12.2. The slight difference in ages is due to the difficulty of getting controls of exactly the same age as the cancer cases, but these differences are insignificant.

The two groups are practically identical regarding the economic status of the individual, although there are fewer cancer cases among the well to do, as shown in Table 1.

TABLE 1  
ECONOMIC STATUS

	Poor	Moderate	Well to do	Unknown
Cancer group	35	172	7	3
Control group	45	161	18	3

TABLE 2

	Semitic	Black	Others	Unknown
Cancer group	29	5	177	8
Control group	28	3	186	0

In respect to race, there is little difference between the cancerous and the controls.

When the two groups are compared by country of birth of individuals, the native born are in excess of the foreign born, but the difference is within the limit of chance fluctuation. When we consider the country of birth of the father and mother we find the differences are greater. In a previous paper<sup>1</sup> we found that cancer was more prevalent among the foreign born and children of foreign born than among the children of native parents. In selecting the controls it is most difficult to get individuals whose parents are born in the same countries as those of the cancer patients. Our cancer group, therefore, has more individuals with foreign parents than the control group.

In Table 4 a comparison of the two groups relative to the conjugal state shows that there are more single females among the control group than among the cancer group. In order to determine if this difference was due to our sample, the female deaths from cancer in the State were compared by conjugal state with our sample, with the resulting figure of 16.2 per cent. for the State and 13.6 per cent. for the sample. The cancer group evidently has too few single females, and the control group has too many, as several of the nurses used themselves as controls.

TABLE 4  
CONJUGAL STATE

	Cancer group			Control group		
	M.	F.	T.	M.	F.	T.
Single	7	22	29	6	41	47
Married	30	84	116	37	71	108
Widowed	17	50	67	9	47	56
Divorced	1	1	2	2	1	3
Separated	0	3	3	0	2	2
Unknown	0	0	0	1	0	1

In order to determine how representative our sample of cancer cases was in respect to type, comparison has been made on a percentage basis

TABLE 3  
NATIVITY

	Birthplace of Individual		Birthplace of Father		Birthplace of Mother	
	Cancer group	Control group	Cancer group	Control group	Cancer group	Control group
United States	86	103	40	65	37	63
Ireland	42	38	71	57	71	58
Russia-Poland	14	14	15	17	14	15
Italy	6	4	6	5	6	5
England, Scotland, Wales	24	18	24	23	27	25
Germany, Austria, Holland, Belgium	5	3	7	8	6	8
Norway, Denmark, Sweden	4	4	6	6	5	5
Greece, Spain, Portugal, France	0	1	0	2	0	0
Canada (French)	15	6	18	6	20	7
Canada (Others)	16	20	22	21	23	24
Lithuania, Finland	0	2	0	2	0	2
All others	5	4	8	5	8	5

with the types found in the Massachusetts Hospitals, in the death returns, and in the State-aided cancer clinics. It is impossible to arrive at a precise figure. The death returns do not include the cures. The hospital admissions do not account for the many patients remaining at home. The volume of the clinic cases is too small on which to base judgment.

Table 5 shows the various distributions.

TABLE 5  
PERCENTAGE DISTRIBUTION OF CANCER CASES BY TYPE

Type	Nurses' Questionnaires	Cancer admissions to hospitals	State-aided clinics	Deaths
Buccal cavity	13.8	9.6	22.6	5.6
Stomach group	18.9	17.2	2.5	31.4
Intestinal group	14.7	12.9	4.8	18.2
Female genitals	21.6	20.4	13.4	13.9
Skin	2.3	2.6	30.2	2.1
Male genitals	1.4	3.5	1.6	3.4
Breast	20.7	16.3	19.1	10.8
Other organs	5.1	14.6	1.6	12.2
Unspecified	1.4	2.8	4.1	2.4

The above discussion of comparisons of the cancer and control groups emphasizes the difficulties of getting satisfactory controls. We believe, however, they are as good as can be obtained, but as we realize their inadequacy, we have arrived at conclusions only after due consideration of the known differences between the groups.

**COMPARISON OF CANCER AND CONTROL GROUPS:**—The contagion theory was studied by comparing the two groups in respect to the previous association with cancer patients. Table 6 shows that there is no relationship.

TABLE 6  
ASSOCIATION WITH CANCER PATIENTS

	None or slight	Association	Unknown
Cancer group	146	19	52
Control group	154	29	34

The work of several laboratory investigators shows convincing evidence in favor of the hereditary predisposition to develop cancer. There is also a slight amount of evidence from human material. We have attempted to measure the difference between the cancer and the control groups regarding heredity in Table 7, but we realize that social as well as genetic differences may be thus depicted. Forty-one per cent. of those with negative heredity history of cancer in more distant relative fall in the cancer group, while we should expect fifty per cent. Also it is

noticeable that sixty-one per cent. of the "unknowns" fall in the cancer group. Both these differences are highly significant statistically. The difference between the two groups with respect to positive heredity history is not significant. No inference can be made unless we know how the unknowns would be distributed if they were known. We found that there was a considerably larger percentage of foreign born among the unknowns of the cancer group, and assuming that the foreign born person in the cancer age cannot well remember or perhaps never knew the causes of death of his more distant relatives, it is reasonable to expect that some of the unknowns at least would have a positive history. Therefore, we feel that there may have been a relationship shown in the following table if we had all of the information. This applies almost equally well to the heredity history in the immediate family.

TABLE 7  
HEREDITY

	Cancer Group		Control Group	
	Cancer in immediate family	Cancer in more distant relatives	Cancer in immediate family	Cancer in more distant relatives
Present	26	23	24	14
Absent	121	96	151	140
Unknown	70	98	42	63

Housing conditions were used to measure the parasitic theory. It is believed that cockroaches and other vermin, possible carriers of parasites, would be more prevalent where the housing conditions were poor, than where they were good. Table 8 shows no connection between cancer and housing.

TABLE 8  
HOUSING CONDITIONS

	Good	Bad	Unknown
Cancer group	157	51	9
Control group	158	55	4

Constipation has been considered a possible cause of cancer. The users of laxatives have been studied to measure any possible connection between constipation and cancer. Table 9 shows no significant difference between the two groups.

TABLE 9  
USE OF LAXATIVES

	Users	Non-users	Unknown
Cancer group	155	22	10
Control group	180	28	9

The female cancers for all types by the number of children are compared with cancers of the female genitals and cancers of the breast in Table 10. The findings are not statistically significant, probably because of the small figures, but the results are consistent with those of the Health Section of the League of Nations<sup>6</sup>. They found that cancer of the uterus is more prevalent and cancer of the breast less prevalent among women who have borne children than among those who had not. Seventy-five per cent. of our total group have borne children while seventy-seven per cent. of those with cancer of the female genitals and seventy-two per cent. of those with cancer of the breast had children.

TABLE 10

CANCERS AMONG FEMALES BY THE NUMBER OF CHILDREN

	Total cancers	Female genitals	Breast
No children	40	11	12
One child	20	3	6
Over one child	98	23	25
Unknown	4	0	3

The possible relationship between exercise and cancer is measured in Table 11, and found to be significant.

TABLE 11  
EXERCISE BEFORE ILLNESS

	Great	Mod- erate	Little	Un- known
Cancer group	64	120	26	7
Control group	57	118	25	17

Height and weight are both studied and while height shows no significance there was a tendency among the cancer group to be underweight. This difference may be due to the probability that the nurses classified their patients by the present weight rather than the normal weight before illness.

TABLE 12  
HEIGHT

	Short	Medium	Tall	Un- known
Cancer group	37	142	38	0
Control group	32	131	51	3

TABLE 13  
WEIGHT

	Slim	Me- dium	Very Stout	Un- stout	Un- known
Cancer group	70	96	42	9	0
Control group	36	118	54	6	3

Chronic past illnesses were studied to determine if any relationship existed between them

and cancer. The only significant difference between the cancer cases and the controls appears in the chronic diseases of the teeth in males. This disease is over three times as prevalent among the cancer group as among the control group and is statistically significant, as forty per cent. of the male patients with cancer had bad teeth and only eleven per cent. of the controls. Among the females thirteen per cent. of the cancerous patients and twenty per cent. of the controls had bad teeth. A check was made of this sample by getting similar figures from the clinic cases<sup>12</sup>. The cancer group was here compared with a control group so selected from those attending the clinics with no evidence of cancer as to make the two groups similar in respect to age and sex. We found 9.2 per cent. of the males with cancer, 3.6 per cent. of the male controls, 4.6 per cent. of the females with cancer and 1.7 per cent. of the female controls had bad teeth. The figures for males are consistent with those given in Table 14 but are only on the border line of significance. The females differ from those in Table 14 as they have a

TABLE 14  
CHRONIC PAST ILLNESS BY SEX

	Cancer Group		Control Group	
	Male	Female	Male	Female
Stomach	17	60	14	54
Female genitals		30		12
Intestinal trouble	14	62	14	53
Breast		13		12
Nervous trouble	11	64	7	58
Skin	1	5	1	7
Lungs	3	2	3	7
Bladder	2	10	3	5
Heart	2	7	9	15
Teeth	22	21	6	33
None	7	25	12	22
Unknown	7	21	6	17

higher percentage of bad teeth in the cancer group. The difference, however, is insignificant. There are a smaller number of individuals with bad teeth among the clinic cases than in the nurses' study. This difference is believed to be due to the better economic status of the individuals attending the State-aided Cancer Clinics. It might be thought that the excess of bad

TABLE 15  
MALE CANCERS AND TEETH

	Had teeth	Not bad teeth	Total
Buccal cavity cancers	7	10	17
All other cancers	15	23	38
Total	22	33	55
Per cent of buccal cavity cancers	31.8	30.3	30.9

teeth in males might have some relation to the excess of cancer of the buccal cavity in males, but the sub-division of cancer by type among

males showed no relationship and therefore the bad teeth may be regarded as a source of toxicity affecting total cancer rather than a source of chronic irritation affecting the cancers of the mouth.

Various foods have been studied to determine if there was any relationship between their ingestion and cancer. Table 16 shows, with the exception of dry vegetables and tea and coffee, that the cancer cases are less of the various articles of food than the controls. This probably is accounted for by the presence of the disease itself. In the continuation of this study we are seeking information on the foods eaten prior to illness, as in many cases the diet has changed after the inception of the disease.

TABLE 16  
DIET

	Cancer Group			Control Group		
	Heavy	Occasional or never	Unknown	Heavy	Occasional or never	Unknown
Meat	139	48	30	162	42	13
Sugars	111	91	18	142	71	4
Starches	181	25	11	200	14	3
Canned goods	35	161	21	50	153	14
Green vegetables	125	75	17	147	68	2
Other vegetables	44	139	34	42	150	25
Milk products	176	27	14	196	20	1
Coffee, Tea	189	14	14	185	28	4

The ingestion of salt has been considered by several as predisposing to cancer.<sup>10</sup> Table 17 points to no relationship between salt and cancer.

TABLE 17  
SALT

Cancer group	Much	Moderate	Little	Unknown
	Cancer group	35	127	39
Control group	42	110	56	9

The use of alcohol shows no relation with cancer. The unknowns, however, are so many that they might alter the conclusions.

The use of tobacco has long been considered a factor in the incidence of cancer of the buccal cavity. Dr. Hoffman gives the smoking habits of

cancer patients by the site of the disease in his San Francisco Survey. We have realigned Dr. Hoffman's figures in preparing Table 19.

TABLE 19

PERCENT OF EXCESSIVE SMOKERS BY TYPE OF CANCER

	Percent	No. of cases
Cancer of the throat	54	13
Cancer of the intestines	100	5
Cancer of the pancreas	33	3
Cancer of the rectum	88	8
Cancer of the lung	100	5
Cancer of the bladder	60	10
Cancer of the lip	92	12
Cancer of the jaw	100	5
Cancer of the neck	83	6
Cancer of the cheek	100	12
Cancer of the oesophagus	77	13
Cancer of the prostate	100	9
Cancer of the tongue	100	7
Cancer of the stomach	82	39
Cancer of the leg	50	2
Sarcoma	73	15
Miscellaneous	60	20

If we postulate that only cancers of certain sites should be affected by heavy smoking, and that those of other sites should not be so affected, and that sarcoma also should not be influenced by tobacco smoking, we can then compare the sites supposed to be affected by smoking with the other two groups which now can be regarded somewhat as controls. These figures, however, give no light upon the relation of smoking to cancer in general. Including under "sites supposed to be affected by smoking" cancers of the lip, jaw, cheek and tongue, and under "sites

TABLE 20  
CANCER SITES BY SMOKING

	Sites supposed to be affected by smoking	Sites not supposed to be affected by smoking	Sarcoma	Total
Heavy smokers	34	106	11	145
Not heavy smokers	1	34	4	39
Total	35	134	15	184
Per cent of heavy smokers	97.2	74.6	73.3	78.8

TABLE 18

ALCOHOL

	Temperate Use									Intemperate Use								
	Users			Non-users			Unknown			Users			Non-users			Unknown		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
Cancer group	33	30	63	12	109	121	10	23	33	10	2	12	24	125	149	21	35	56
Control group	35	36	71	16	106	122	4	20	24	6	0	6	35	135	170	14	27	41

not supposed to be affected by smoking" all other cancers, we show the results in Table 20.

Of all males who have cancer in the above sample 78.8 per cent. are heavy smokers. Dr. Hoffman found in his larger sample of 834 male patients<sup>10</sup> that 44.1 per cent. were heavy smokers. In our sample, 47.3 per cent. were found to be heavy smokers. What is the true percentage of heavy smokers among males with cancer? Evidently the sample quoted in Tables 18 and 19 is not representative of the cancer population. What is the percentage of heavy smokers in the general population? We do not know. Dublin, Fiske and Kopf<sup>11</sup>, among 16,662 male policy holders in the Metropolitan Life Insurance Company, found 33.1 per cent. to be heavy smokers. In our control sample we found twenty per cent. heavy smokers and in our total group, including both cancers and controls, we found 33.7 per cent.

The difference between our control group and the cancer group in respect to heavy smoking is twenty-seven per cent. This is highly significant which suggests that heavy smoking has some relation to cancer in general. Of the heavy smok-

TABLE 21  
CANCER SITES BY SMOKING

	Sites supposed to be affected by smoking	Sites not supposed to be affected by smoking	Total
Heavy smokers	9	17	26
Not heavy smokers	8	21	29
Total	17	38	55
Per cent of heavy smokers	52.3	44.8	47.3

ing group, pipe smoking seems to be the most important, as 73.1 per cent. of the heavy smokers in the cancer group are pipe smokers and 72.6 per cent. of the heavy smokers in the control group are pipe smokers.

In Table 20 there is a difference of eighteen per cent. between the heavy smokers who had cancer of the buccal cavity and the total per cent. of heavy smokers. This is statistically significant and indicates that a small part of the

buccal cavity cancers may be due to smoking. Table 21 prepared from our figures is consistent with Table 20, but it is not significant, due probably to the small size.

Table 22 compares the cancer and control groups from the nurses' questionnaires by smoking habits and Table 23 shows the smoking habits of those individuals who had cancer of the buccal cavity. The relationship between cancer of the buccal cavity and smoking appears from our figures to be due to pipe smoking alone.

TABLE 23  
BUCCAL CAVITY CANCERS BY USE OF TOBACCO

	Users	Non-users	Unknowns
Pipe	16	9	5
Cigarette	5	12	13
Cigar	10	12	8
Chewing	6	14	10

The study is being continued, narrowing the field of inquiry to the amount of salt eaten, the amount of condiments, canned goods, foods ordinarily eaten prior to illness, constipation and tobacco. In the 1928 study, the classification of foods is broader than in the present one.

#### DISCUSSION:

Throughout the study the "Unknown" item has been the most unsatisfactory. Such conclusions as we have drawn are made on the assumption that the unknowns are distributed in the same ratio as the known items. This is the most probable inference but it is by no means assured. In those tables in which the unknowns differ markedly from the controls they could easily alter the findings.

It should also be noted that when any two groups are compared with respect to a large number of variables, the differences themselves will form a frequency distribution and some of the variables with statistical significance may thus be entirely due to chance. In order to determine whether or not there is real significance in a given instance it is necessary that additional samples be obtained.

#### CONCLUSIONS:

Variations in the habits of cancer patients cannot be studied without the use of good con-

TABLE 22  
TOBACCO

	Cancer Group									Control Group								
	Users			Non-users			Unknowns			Users			Non-users			Unknowns		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
Pipe	33	1	39	11	124	135	6	37	43	27	1	28	25	137	162	3	24	27
Cigarette	11	1	12	21	126	147	23	35	58	9	4	13	38	134	172	8	24	32
Cigar	23	1	24	16	125	141	16	36	52	29	0	29	22	136	158	4	26	30
Chewing	13	0	13	22	126	148	19	37	56	12	1	13	35	134	169	8	27	35

trols, which are most difficult to obtain. We believe our sample to be as nearly satisfactory as is reasonably possible to get on a large scale.

As only large differences between controls and cancers need be considered the size of the sample is adequate.

The collection of data on cancer patients without similar data on controls is valueless in the determination of factors influencing the causation of cancer.

Bad teeth in males are more common among the cancer group than among the controls. This applies to cancer in general and is not limited to buccal cavity cancer.

Heavy smoking is more common in the cancer group than among the controls. In our sample heavy smoking was largely pipe smoking and was particularly more common in those individuals with cancer of the buccal cavity.

The figures gave a suggestion of a hereditary predisposition to cancer but the volume of unknowns made definite conclusions impossible.

The cancer group ate less than the controls but this probably is wholly due to the presence of the disease.

Although we realize that the figures in this study are too small and incomplete for significant conclusions to be drawn, they are presented to show the methods used in order that others may conduct similar studies. We feel that other independent samples collected in a like manner would do much to either prove or disprove our findings.

We wish to make acknowledgment to Dr. Frederick Hoffman for the suggestion which instigated this

study; to Dr. John A. Nichols for his courtesy in allowing us to interview his patients at Tewksbury; to Miss Mary P. Cronin for collecting material at Tewksbury and editing all the questionnaires; to the following visiting nursing organizations for giving so freely of their time in collecting the data: Instructive Nursing Association, New Bedford; Lowell Visiting Nurse Association; Worcester Visiting Nurse Association; Brockton Visiting Nurse Association; Community Nursing Association, Boston; Hingham Visiting Nurse Association; District Nursing Association of Fall River; Newton Visiting Nurse Association; Fitchburg Visiting Nurse Association; and the Lynn Visiting Nurse Association.

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## THE EARLY DIAGNOSIS OF CARCINOMA OF THE RECTUM

BY DANIEL FISKE JONES, M.D., F.A.C.S.\*

THE diagnosis of carcinoma of the rectum is dependent upon an opportunity to see the patient, that is, there should never be an error in diagnosis after the physician has had an opportunity to examine the patient. Training of the laity to seek advice on the slightest suggestion of any change in bowel habit or sensation, or bleeding from the rectum is of the greatest importance. Training of the physician to make a digital and proctoscopic examination of the rectum is of equal importance. The training of one group and not the other would accomplish nothing. It is a fact that the only early symptoms are a change in bowel habit or sensation, and bleeding.

An early growth before it effects obstruction, should cause slight irritation and should cause slightly increased peristalsis or a sensation of some material still left in the rectum. Carcinoma of the bowel ulcerates early and therefore bleeding should be an early symptom. The usual

text-book symptoms, which are late symptoms, are:

- (1) *Constipation.* This symptom cannot be present until the growth blocks the intestine more or less. At the present time when mineral oil and cathartics are used to such an extent the time when this symptom makes an impression is much later than formerly. One must not only inquire about constipation but must ask about the increase in the dose of cathartics and as to whether the patient is taking mineral oil.
- (2) *Constipation and Diarrhoea.* This is a text-book symptom which is rarely spoken of by the patient. Their idea is that they have frequent movements after constipation because they have taken cathartics. They rarely admit that they have a diarrhoea but do admit that they have from three to twenty discharges a day. They distinguish between frequent

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