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CENTER FOR DISEASE CONTROL

LEUKEMIA SURVEILLANCE

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION

PREFACE

This report contains data obtained through a program of leukemia surveillance established by the Center for Disease Control in 1966, in collaboration with certain state and local health departments. The program's goals are 1) to maintain a registry of current data regarding leukemia incidence in participating areas and, 2) to support studies of oncogenesis by identifying individual cases or groups of cases in which special epidemiologic or laboratory studies may be desirable.

Data in this report are for the most part preliminary and are primarily intended for the information of persons concerned with studies of leukemia and related disorders. Anyone wishing to inquire about the contents of the report, or to quote portions of it, should contact:

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I. SUMMARY

Data are presented concerning 561 cases of leukemia diagnosed during 1970 in eight states and metropolitan areas participating in leukemia case surveillance. The number of cases closely approximates expected incidence for these populations. The 1970 data are compared with similar surveillance information for the preceding 4 years, 1966-1969. Case distributions by cell type, age, sex, and race followed expected patterns, and no marked trends by year or season of occurrence were seen in any area.

Occasional cases or case groups were reported with unusual epidemiologic or genetic features which may perhaps be related to etiology. Four such case groups are described in detail: 1) childhood leukemia in Middletown, Connecticut, associated with a particular Roman Catholic parish and elementary school in the community, 2) acute leukemia in three teenagers attending one high school in Wantagh, New York, and diagnosed over a period of two school years, 3) four cases of chronic lymphocytic leukemia in members of a Georgia family including a man, his wife, and their son, and 4) eight cases of acute leukemia in Pleasant Grove, Utah, primarily affecting children and appearing largely in two clusters, one in 1967 and one in 1969.

II. INTRODUCTION

Four states and four metropolitan areas (total population 10,662,656) currently participate in the Leukemia Surveillance Program. The scope of surveillance varies from one reporting area to another. In each area data are collected concerning all cases of childhood leukemia. In some instances, however, all cases of leukemia in all ages are included, and in others, cases of lymphoma in all ages and cases of childhood malignancies other than leukemia. In most areas, information is obtained not only for cases among area residents, but also for non-resident cases diagnosed or treated in the area. This report is concerned only with cases of leukemia diagnosed during the 5-year period 1966-1970 in persons resident in reporting areas at time of diagnosis. Special attention is given to cases diagnosed in 1970.

A main objective in each reporting area is to learn of newly diagnosed cases of leukemia as soon after diagnosis as possible. Sources of information differ somewhat from area to area but generally entail hospital records, reports from hematologists and pathologists, and death certificates. While intervals between date of diagnosis and date of report vary, most cases, and particularly cases of acute leukemia in young persons, are reported within one or two months after diagnosis.

Colorado - (1960 population under age 15;569,058): Surveillance of childhood leukemia and lymphomas was begun in 1970, with retrospective data assembled from January 1, 1966. Case reporting is conducted in cooperation with Cecil S. Mollohan, M.D., Director, Division of Preventable Medical Services, Colorado State Dept. of Health, and Charlene P. Holton, M.D., Director of Clinical Oncology, Denver Children's Hospital.

Connecticut - (1960 total population 2,535,234): Surveillance of leukemia at all ages was begun in 1966, and is conducted in cooperation with James C. Hart, M.D., Director, Division of Preventable Diseases, and Barbara W. Christine, M.D., Chief, Chronic Disease Control Section, Connecticut State Department of Health.

Rhode Island - (1960 total population 859,488): Cases of leukemia at all ages are reported by Louis A. Leone, M.D., Director, Department of Oncology, Rhode Island Hospital, Providence, in cooperation with the Rhode Island Department of Health. Surveillance was begun in 1967, with retroactive data available to 1960.

Utah - (1960 population under age 15; 334,292): Surveillance of childhood leukemia is conducted by Taira Fukushima, M.D., State Epidemiologist, Utah State Division of Health, in cooperation with M. E. Lahey, M.D., Department of Pediatrics, University of Utah Medical Center.

Metropolitan Atlanta - (1960 total population 1,017,188): Surveillance of all cases of leukemia and lymphoma at all ages and of all childhood cancers among residents of the 5-county metropolitan area (Clayton, Cobb, DeKalb, Fulton, and Gwinnett Counties) is conducted by CDC in cooperation with county health departments and with John E. McCroan, Ph.D., State Epidemiologist, Georgia Department of Public Health. The program was begun in 1966 and includes case data retrospective to January 1, 1956.

Metropolitan Kansas City - (1960 total population 1,062,843): All cases of leukemia are reported through the Ecological Investigations Program, CDC, for the 5- county metropolitan area (Johnson and Wyandotte Counties in Kansas, and Clay, Jackson, and Platte Counties in Missouri) in cooperation with local health departments and the state health departments of Kansas (Donald E. Wilcox, M.D., Director, Division of Epidemiology and Disease Control, Kansas State Department of Health), and Missouri (C.W. Meinershagen, M.D., State Epidemiologist, Missouri Department of Public Health). Surveillance activities were begun in 1966.

Harris County, Texas - (1960 total population 1,243,158): All cases of leukemia and lymphoma at all ages and all childhood cancers in residents of Houston and Harris County are reported through Donald J. Fernbach, M.D., Director, Hematology Research Laboratory, Texas Children's Hospital, in cooperation with the Houston and Harris County Health Departments and the Texas State Department of Health. Reporting began in 1967. Additional incidence data concerning all cases of childhood malignancies have been collected back to January 1, 1968.

Nassau County, N.Y. - (1960 population under age 15; 442,844): Surveillance of childhood leukemia has been conducted since 1967 under the direction of Joseph H. Kinnaman, M.D., Commissioner of Health, Nassau County Health Department, in cooperation with Peter Greenwald, M.D., Director, Bureau of Cancer Control, New York State Department of Health.

III. INCIDENCE DATA

A. Comparison with Expected incidence: A total of 561 cases of leukemia diagnosed during 1970 were reported from the eight participating areas. Table 1 compares reported cases by three broad age groups in each area with expected incidence calculated in an age-specific manner from 1960 population data and 1967 U.S. leukemia mortality rates. Although population growth makes these expected figures minimal estimates of incidence, they are sufficient for rough comparison. In general, observed numbers of cases closely resemble expected, particularly in younger ages, suggesting that case reporting is relatively complete. In the 50+ age group, however, observed numbers of cases exceed expected for all reporting areas except Rhode Island. These excesses probably reflect the fact that leukemia mortality rates do not approximate true incidence as closely in older age groups as in younger, chronic forms of leukemia being more common at older ages, and not as completely reported on death certificates as more acute forms.

Table 1

Cases of Leukemia by Observed and Expected* Numbers and by Age and Reporting Area, 1970

Reporting area	Number of cases by age group						Unknown age	Total	
	0-14		15-49		50+				
	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.		Obs.	Exp.
Colorado	18	20.0	-	-	-	-	-	18	20.0
Connecticut	25	26.6	33	33.2	136	127.3	1	195	187.1
Rhode Island	9	8.5	8	11.0	28	46.4	-	45	65.9
Utah	7	10.9	-	-	-	-	-	7	10.9
Atlanta	12	10.1	17	13.3	65	33.9	-	94	57.3
Kansas City	14	11.1	18	13.2	80	50.9	-	112	75.2
Harris County	19	13.5	18	16.3	39	37.5	-	76	67.3
Nassau County	14	15.6	-	-	-	-	-	14	15.6
Total	118	116.3	94	87.0	348	296.0	1	561	499.3

Trends by year: Numbers of cases diagnosed by year are shown in Table 2 according to age group in each reporting area. No marked trends are apparent, either by age group or by area. Numbers of cases recorded for 1970 are generally lower than in each preceding year (excluding 1966) with the exception of those reported for Atlanta and Kansas City. This would suggest that case detection is not yet as complete for 1970 as for earlier years. The deficit is most clearly seen in the 50+ age group.

Distribution of cases by cell type: Cases both in 1970 and in the preceding 4 years follow expected patterns of cell type distribution (Table 3). In those areas where cases at all ages are reported, acute leukemia accounts for about 60 percent of all cases. Acute granulocytic leukemia (AGL) is more commonly diagnosed than acute lymphocytic leukemia (ALL), although the proportion of AGL to ALL varies considerably from one area to another. Chronic lymphocytic leukemia (CLL) is more frequently diagnosed than is chronic granulocytic leukemia (CGL), the proportion approaching 2:1 in most instances.

Table 2

Cases of Leukemia by Age, Year of Diagnosis, and Reporting Area

Reporting area	Age group	Year of diagnosis 1966	1967	1968	1969	1970	Total
Colorado	0-14	13	11	29	26	18	97
Connecticut	0-14	18	33	24	30	25	130
	15-49	41	31	43	28	33	176
	50+	127	210	190	152	136	815
	Unknown	-	1	-	-	1	2
	Total	186	275	257	210	195	1123
Rhode Island	0-14	13	9	3	14	9	48
	15-49	23	7	11	11	8	60
	50+	53	57	39	37	28	214
	Total	89	73	53	62	45	322
Utah	0-14	-	14	12	13	7	46
Atlanta	0-14	9	13	15	13	12	62
	15-49	28	18	13	21	17	97
	50+	45	43	58	55	65	266
	Total	82	74	86	89	94	425
Kansas City	0-14	18	13	6	14	14	65
	15-49	12	34	29	16	18	109
	50+	66	68	70	71	80	355
	Total	96	115	105	101	112	529
Harris Co.	0-14	23	16	18	20	19	96
	15-49	-	24	22	30	18	94
	50+	-	68	51	54	39	212
	Total	23	108	91	104	76	402
Nassau Co.	0-14	6	11	15	17	14	63
Total	0-14	100	120	122	147	118	607
	15-49	104	114	118	106	94	536
	50+	291	446	408	369	348	1862
	Unknown	-	1	-	-	1	2
	TOTAL	495	681	648	622	561	3007

Table 3

Cases of Leukemia, by Cell Type,
Year of Diagnosis, and Reporting Area

Type of Leukemia	Colorado		Connecticut		Rhode Island		Utah		Atlanta		Kansas City		Harris County		Nassau County		Total	
	1966-69	1970	1966-69	1970	1966-69	1970	1967-69	1970	1966-69	1970	1966-69	1970	1966-69	1970	1966-69	1970	1966-69	1970
Acute or Subacute	72	18	552	108	154	27	39	7	194	53	238	61	195	53	48	13	1492	340
Lymphocytic	61	12	126	29	59	13	32	4	64	16	63	20	71	13	38	11	514	118
Granulocytic	7	6	296	65	68	11	5	2	87	29	131	31	96	32	7	1	697	177
Other	1	-	105	10	17	2	-	-	40	5	39	8	16	3	2	-	220	28
Unknown	3	-	25	4	10	1	2	1	3	3	5	2	12	5	1	1	61	17
Chronic	2	-	364	75	116	17	-	-	131	37	176	48	129	21	1	1	919	199
Lymphocytic	-	-	233	42	67	14	-	-	84	28	135	35	80	16	-	-	599	135
Granulocytic	2	-	124	32	49	3	-	-	44	9	41	12	49	5	1	1	210	62
Other	-	-	1	1	-	-	-	-	3	-	-	1	-	-	-	-	4	2
Unknown	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-
Unknown	5	-	12	12	7	1	-	-	6	4	3	3	2	2	-	-	35	22
Lymphocytic	3	-	-	1	3	1	-	-	1	-	1	3	-	2	-	-	8	7
Granulocytic	-	-	4	5	3	-	-	-	1	2	2	-	1	-	-	-	11	7
Other	1	-	1	2	-	-	-	-	4	2	-	-	-	-	-	-	6	4
Unknown	1	-	7	4	1	-	-	-	-	-	-	-	1	-	-	-	10	4
Total	79	18	928	195	277	45	39	7	331	94	417	112	326	76	49	14	2446	561

Distribution of cases by age, race, and sex: Table 4 shows the distribution of 1970 cases by age, race, and sex in the five reporting areas from which cases are reported in all age groups. As expected the majority of cases (about two-thirds) were in persons age 50 and over. In keeping with the racial composition of the populations concerned, cases among whites were over 10 times more numerous than cases among blacks. The childhood age peak in the 1-4 and 5-9 age groups was readily seen in the white cases but not in the blacks. Only one case was reported among other ethnic groups, a case of AGL in a 17-year-old Japanese boy. As might be expected, cases among males were more frequent than among females, about 60 percent of all cases being male. While this male-over-female excess was seen in virtually every age group, it was most marked in the 40-69 age range.

Table 4

Cases of Leukemia, by Age at Diagnosis, Race, and Sex
(Excludes Colorado, Utah, and Nassau County)

Race and sex	Age at Diagnosis													
	<1	1-4	5-9	10-14	15-19	20-29	30-39	40-49	50-59	60-69	70-79	80+	Unknown	Total
White	5	37	22	10	11	13	21	32	55	94	113	57	1	471
Male	2	22	12	2	7	9	12	24	41	65	60	32	1	289
Female	3	15	10	8	4	4	9	8	14	29	53	25	-	182
Black	-	1	1	3	2	3	2	7	5	8	6	2	-	40
Male	-	1	1	3	1	2	1	3	3	5	2	2	-	24
Female	-	-	-	-	1	1	1	4	2	3	4	-	-	16
Other	-	-	-	-	1	-	-	-	-	-	-	-	-	1
Male	-	-	-	-	1	-	-	-	-	-	-	-	-	1
Female	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	-	1	-	1	1	2	4	1	-	10
Male	-	-	-	-	-	-	-	1	1	-	-	1	-	3
Female	-	-	-	-	-	1	-	-	-	2	4	-	-	7
Total	5	38	23	13	14	17	23	40	61	104	123	60	1	522
Male	2	23	13	5	9	11	13	28	45	70	62	35	1	317
Female	3	15	10	8	5	6	10	12	16	34	61	25	-	205

Distribution of cases by age and cell type: Table 5 shows 1970 cases by age group and cell type in those five areas that report from all ages. The expected patterns of cell type distribution can be seen: the striking predominance of ALL in children under age 10, the clear tendency for AGL to affect adults primarily, and, among the chronic leukemias, the tendency for CGL to occur at somewhat younger ages than CLL. Numbers of cases were too small to make it worthwhile separating cases into other than these four major cell type categories. While the frequency with which particular cell types, especially acute leukemia, were diagnosed in particular age groups did vary somewhat in different reporting areas, the variations were not striking and the general patterns of cell type distribution noted above held true in all five areas. Illness was designated as acute, subacute, or chronic in over 95 percent of the cases.

Table 5

Cases of Leukemia, by Age and Cell Type
(Excludes Colorado, Utah, and Nassau County)

Type of leukemia	Age at diagnosis <1	1-4	5-9	10-14	15-19	20-29	30-39	40-49	50-59	60-69	70-79	80+	Unk.	Total
Acute & subacute	5	38	23	13	13	10	15	23	27	44	58	32	1	302
Lymphocytic	3	32	20	9	6	3	2	3	1	4	5	3	-	91
Granulocytic	1	1	-	4	6	4	10	18	22	34	43	24	1	168
Other	1	1	2	-	-	3	1	1	3	6	7	3	-	28
Unknown	-	4	1	-	1	-	2	1	1	-	3	2	-	15
Chronic	-	-	-	-	1	6	8	17	33	56	56	21	-	198
Lymphocytic	-	-	-	-	-	-	2	7	22	52	40	12	-	135
Granulocytic	-	-	-	-	1	6	6	10	11	4	16	7	-	61
Other	-	-	-	-	-	-	-	-	-	-	-	2	-	2
Unknown	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unknown	-	-	-	-	-	1	-	-	1	4	9	7	-	22
Lymphocytic	-	-	-	-	-	1	-	-	-	1	3	2	-	7
Granulocytic	-	-	-	-	-	-	-	-	1	2	3	1	-	7
Other	-	-	-	-	-	-	-	-	-	1	3	-	-	4
Unknown	-	-	-	-	-	-	-	-	-		-	4	-	4
TOTAL	5	38	23	13	14	17	23	40	61	104	123	60	1	522

Distribution by month of diagnosis: Patterns of childhood leukemia by month of case occurrence, all types of leukemia taken together, are shown in Table 6. The date of onset is used as date of occurrence in all but 14 cases where only date of onset was designated. In general the data show very little tendency towards seasonality, either for 1970 alone or for the earlier 4-year period. In Connecticut there has been perhaps a faint tendency for cases to be diagnosed more often in late spring and summer months than in the rest of the year. In other areas, although numbers of cases are small, no similar tendencies suggest themselves.

Cases with unusual features: An occasional case among the 561 diagnosed in 1970 was reported as having unusual epidemiologic or genetic features. The frequency with which such cases are reported from participating surveillance areas varies greatly, depending on the degree to which medical records are reviewed or to which information is sought from patients or their families directly. Fifteen patients were reported as having pre-existing cancer at the time of their leukemia diagnosis. All involved elderly persons with cancer of common organ sites: breast, colon, prostate, cervix. Two cases of acute leukemia were reported in children with Down's syndrome, both from metropolitan Atlanta. Two other cases occurred in children with other birth defects: one with congenital heart disease, the other with cystic fibrosis. In five cases a history of leukemia was reported in first degree relatives: two in parents, two in sibs, and one in a child of a patient. One patient, a 38-year-old woman with ALL, had had a child who died of congenital tracheoesophageal fistula.

Table 6

Cases of Leukemia, Age 0-14,
by Month of Diagnosis and Reporting Area

Reporting area	Year of diagnosis	Month of diagnosis*												Unk.	Total
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec		
Colo.	1966-69	5	10	7	8	7	6	7	4	4	9	6	6	-	79
	1970	1	2	2	1	1	2	2	1	1	2	1	2	-	18
Conn.	1966-69	9	4	8	6	13	12	10	10	7	9	9	8	-	105
	1970	2	2	2	4	-	1	3	-	3	3	4	-	1	25
R.I.	1966-69	2	1	4	2	2	4	-	3	2	11	3	4	1	39
	1970	-	3	-	-	1	1	1	1	-	-	-	2	-	9
Utah	1967-69	3	3	2	3	3	6	4	5	2	2	5	1	-	39
	1970	2	-	-	1	1	-	1	-	1	-	-	1	-	7
Atlanta	1966-69	6	-	6	3	-	3	8	3	3	8	5	5	-	50
	1970	-	1	1	-	1	1	2	1	1	2	1	1	-	12
Kansas City	1966-69	4	6	4	3	7	4	3	-	5	7	4	4	-	51
	1970	-	1	-	2	1	1	2	3	-	3	1	-	-	14
Harris Co.	1966-69	6	4	9	11	2	7	8	8	6	3	7	6	-	77
	1970	2	3	2	-	1	1	1	2	3	1	-	3	-	19
Nassau Co.	1966-69	5	3	5	5	-	5	7	4	5	2	4	4	-	49
	1970	2	-	3	1	-	1	1	-	3	2	-	1	-	14
Total	1966-69	40	31	45	41	34	47	47	37	34	51	43	38	1	489
	1970	9	12	10	9	6	8	13	8	12	13	7	10	1	118

*In 14 cases (Colorado 1966-69) date of onset used in lieu of date of diagnosis.

Unusual environmental features were less frequently recorded, since such features are less likely than genetic associations to be recorded in the sources of data generally used in each reporting area (hospital medical records). Only one instance of human-animal leukemia concordance was recorded: a child with acute leukemia from Utah who was known to have close association with a cat with leukemia. Cases with histories of other unusual environmental exposures included a 51-year-old man with CGL from metropolitan Atlanta who had considerable occupational contact with fumes of methyl acetone and ketones, and a number of patients with pre-existing malignancy who had undergone courses of therapeutic radiotherapy.

An occasional patient was reported as having had contact with unrelated patients with leukemia. In one instance three cases occurred over a short period of time in one school in Connecticut. The details of this situation are described under Special Reports below. Other case contact situations included: a teenage boy from metropolitan Atlanta with AGL whose schoolmate's father developed acute leukemia at the same time, and a 9-year-old boy with ALL in Rhode Island who gave a history of attending school with the sib of another child with leukemia.

IV. SPECIAL REPORTS

From time to time detailed investigations are conducted concerning selected cases or groups of cases which show unusual epidemiologic or genetic features. Summarized below are several such investigations concerned with cases reported from areas participating in the leukemia surveillance program. Three involved cases occurring close together in time and place, and one involved a large family in which multiple cases of CLL have occurred.

A. Childhood leukemia, Middletown, Connecticut

In this town of 32,000 total population, five cases of childhood leukemia and lymphoma were diagnosed in the 3-year period 1967-1969. Expected incidence was estimated at about 0.3 case per year or one case every three or four years. All five cases were from one part of the town, and all were from Roman Catholic families which attended one particular Roman Catholic parish (Parish X). A total of eight cases were found when investigation was extended to cover the 20-year period 1950-1969 (Table 7). Studies were conducted by the Connecticut State Department of Health in cooperation with CDC.

Table 7

Cases of Leukemia and Lymphoma, Age 0-14,
Middletown, Connecticut, 1950-1969

Case No.	Age at diagnosis race, sex	Date of diagnosis	Diagnosis	Family religion	Parish affiliation
1	3 WM	1/50	AGL	Catholic	Y
2	8 WM	5/51	ALL	Protestant	-
3	4 WM	3/57	ALL	Catholic	X
4	4 WF	1/67	ALL	Catholic	X
5	9 WM	4/67	AGL	Catholic	X
6	7 WF	1/69	ALL	Catholic	X
7	11 WF	3/69	RCS→AL	Catholic	X
8	10 WM	5/69	ALL	Catholic	X

The town contains three geographically based Roman Catholic parishes of roughly equal size, and its total population is about two-thirds Catholic. Observed and expected incidence figures (1950-1969) within each parish area are shown in Table 8. Only among Catholics in Parish X did there appear any great discrepancy between observed and expected figures.

Table 8

Incidence of Childhood Leukemia and Lymphoma by Religion
Middletown, Connecticut, 1950-1969

Parish	Religion	Number of Cases Obs.	Exp.
X	Catholic	6	1.0
	Other	0	0.6
Y	Total	2	1.7
Z	Total	0	1.5

The three most recent cases were all diagnosed in the first 6 months of 1969, and all three were in children attending one particular elementary school. The school was one of two in the parish area, and eight in the town as a whole. While the three children were in different grades and their families were not closely acquainted, they did have some contact with each other through parish organizations and weekly religous instruction. The grade school was located across the street from the parish church and was used regularly for church activities and catechism classes.

One additional case was discovered in a family which had belonged to Parish X, but which had moved to an adjacent town in 1959, while maintaining business and social contacts in Middletown. In 1963, a 2-year-old girl in this family developed acute leukemia.

Cases of adult leukemia and lymphoma in the town over the 20-year period did not exceed expected incidence and did not seem unevenly distributed throughout the town. Likewise the overall incidence of childhood malignancies, other than leukemia and lymphoma, was not increased. Of the two cases of childhood cancer recorded for the Parish X area, however, both occurred in Catholic families, one a boy with primary hepatic cancer diagnosed in 1967, and the other a girl with Wilm's tumor diagnosed in 1969.

The association in Middletown of childhood leukemia and lymphoma cases with a particular school and a particular parish is reminiscent of similar associations described in the past for cases in Niles, Illinois (1) and more recently in several other communities (2). In Niles a simultaneous increase was found in cases, resembling acute rheumatic fever, a parallel which suggested that leukemia in that particular setting might have a post-infectious etiology. In Middletown, however, no evidence was found to suggest 1) any unusual increase in infectious diseases or in post-infectious sequelae either at the school or in the parish, or 2) any unusual association of cases with infection-like prodromes. For the present, therefore, the exact etiology of these particular cases remains obscure, despite the fact that their parish and school features make it hard to assign the pattern of occurrence entirely to chance.

B. Leukemia among high school students, Wantagh, New York

Between the fall of 1966 and the spring of 1968, three cases of acute leukemia were diagnosed among students at a high school in Wantagh, New York (Nassau County) (Table 9). Expected incidence of leukemia or lymphoma among students at the school (enrollment 1,746), was estimated to be about one case every 15 years, based upon age specific mortality for the U.S. in 1967.

Table 9

Cases of Leukemia in Teenagers
Wantagh, New York, 1966-1968

Case No.	Age at dx., race, sex	Month and year of Onset	Diagnosis	Death	Diagnosis	Grade
1	14 WM	10/66	11/66	2/68	AGL	9th
2	15 WM	7/67	8/67	2/68	ALL	9th
3	17 WM	4/68	4/68	?	AL	12th

The first two cases occurred 9 months apart in the 1966-67 school year, both in 9th grade students, one with AGL, the other with ALL. Both patients happened to die in February 1968, at which time the situation came to public health attention and an epidemiologic inquiry was begun by the health departments of Nassau County and New York State in collaboration with CDC. Shortly thereafter (April 1968), the third case occurred, acute leukemia of undifferentiated cell type in a 12th grade student.

All three patients had lived in Wantagh since early childhood. They lived in different sections of the town, however, and were not closely acquainted. The two

ninth graders shared several school activities, but were not otherwise particularly close. The mother of the second patient worked at the school as a clerk-secretary.

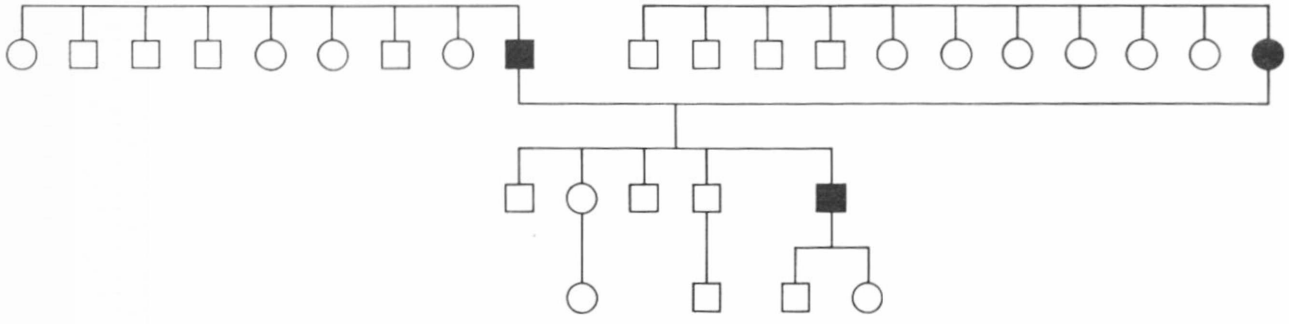
The third case was diagnosed unexpectedly in the course of splenectomy for trauma-related splenic rupture. Leukemia in the first two cases, however, developed following infectious illness, recurrent upper respiratory infection in case 1, and herpes gingivae in case 2. In the latter case a close girl friend developed similar herpes lesions at the same time, and infectious mononucleosis a short time after. Inquiry concerning the incidence of infectious mononucleosis at the school revealed that over twice as many cases had been reported to school health authorities during the 1966-67 school year as during 1967-68. While these various findings suggest the possibility of a relationship between at least the first two cases of leukemia and infectious disease patterns at the school in 1966-67, no more substantial evidence was found to confirm or reject the possibility.

In the course of investigation information was obtained on other cases of leukemia or lymphoma diagnosed in teachers and school employees as well as in residents of the school district. The overall incidence in the area seemed not excessive. Three cases were found in the families of teachers: one in a teacher's son (Hodgkin's disease diagnosed in 1961) and two in teacher's husbands (AGL diagnosed in 1963 and RCS diagnosed in 1967). The patients with Hodgkin's disease and RCS lived in adjacent houses one block from the school and across the street from a non-school-related family in which a 2-year-old girl developed ALL in 1967.

C. Familial chronic lymphocytic leukemia, North Georgia

In June 1970 a 39-year-old man from North Georgia, was found to have CLL. Inquiry concerning his family revealed that both parents of the patient had died of CLL, the mother diagnosed in 1966 at age 73, and the father in 1934 at age 38 (Figure 1). The similarity between the index patient and his father in terms of age at diagnosis was striking. Further investigation of the family showed that a younger sister of the index patient's father (one of 8 sibs) had also died of CLL, first diagnosed in 1961.

Figure 1 CHRONIC LYMPHOCYTIC LEUKEMIA IN A NORTH GEORGIA FAMILY



It has been suggested (3) that familial leukemia is more often a feature of CLL than of other types of leukemia. Thus far in the investigation of this particular family, no other forms of malignancy or other related diseases have yet been found. In at least two other families, however, where multiple cases of CLL and lympho-reticular tumors have occurred, laboratory studies have suggested coexistent immunologic abnormalities (serum immunoglobulins levels, skin test reactivity, lymphocyte responsiveness) both in patients and in healthy close relatives (4,5). Similar studies are being conducted in this particular family as well.

D. Acute leukemia, Pleasant Grove, Utah

In the spring and summer of 1967 three cases of acute leukemia were diagnosed in residents of Pleasant Grove, Utah, and its small neighboring communities of Lindon and Manila (total population about 7,000). Inquiry at that time, conducted by the Utah State Division of Health in collaboration with CDC, revealed a total of five cases diagnosed since 1956, four in children. No striking epidemiologic associations were found among the cases. In the summer of 1969, however, a sixth case was diagnosed, ALL in a 3-year-old boy. A repeat investigation was begun in November 1969, and shortly thereafter a 7th case was diagnosed.

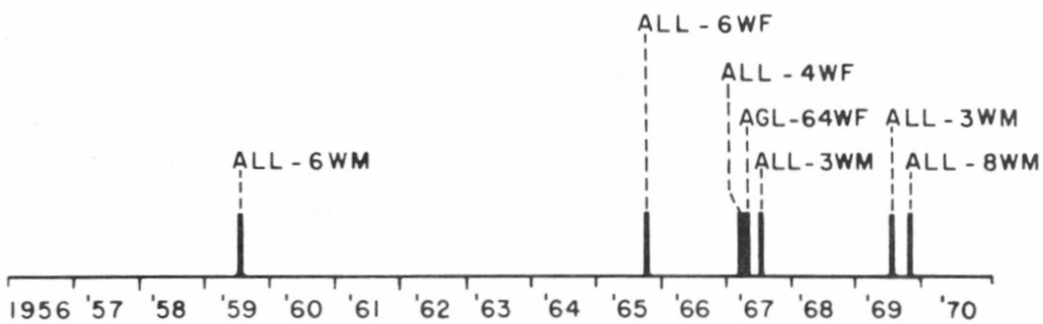
Table 10

Cases of Acute Leukemia
Pleasant Grove, Utah, 1956-1969

Case No.	Age at diagnosis race and sex	Date of diagnosis	Diagnosis	Residence	Family school association
1	6 WM	8/59	ALL	Pleasant Grove	GC
2	6 WF	11/65	ALL	Manila	GC
3	4 WF	4/67	ALL	Pleasant Grove	CS
4	64 WF	6/67	AGL	Lindon	-
5	3 WM	7/67	ALL	Pleasant Grove	CS
6	3 WM	7/69	ALL	Pleasant Grove	CS
7	8 WM	11/69	ALL	Pleasant Grove	GC

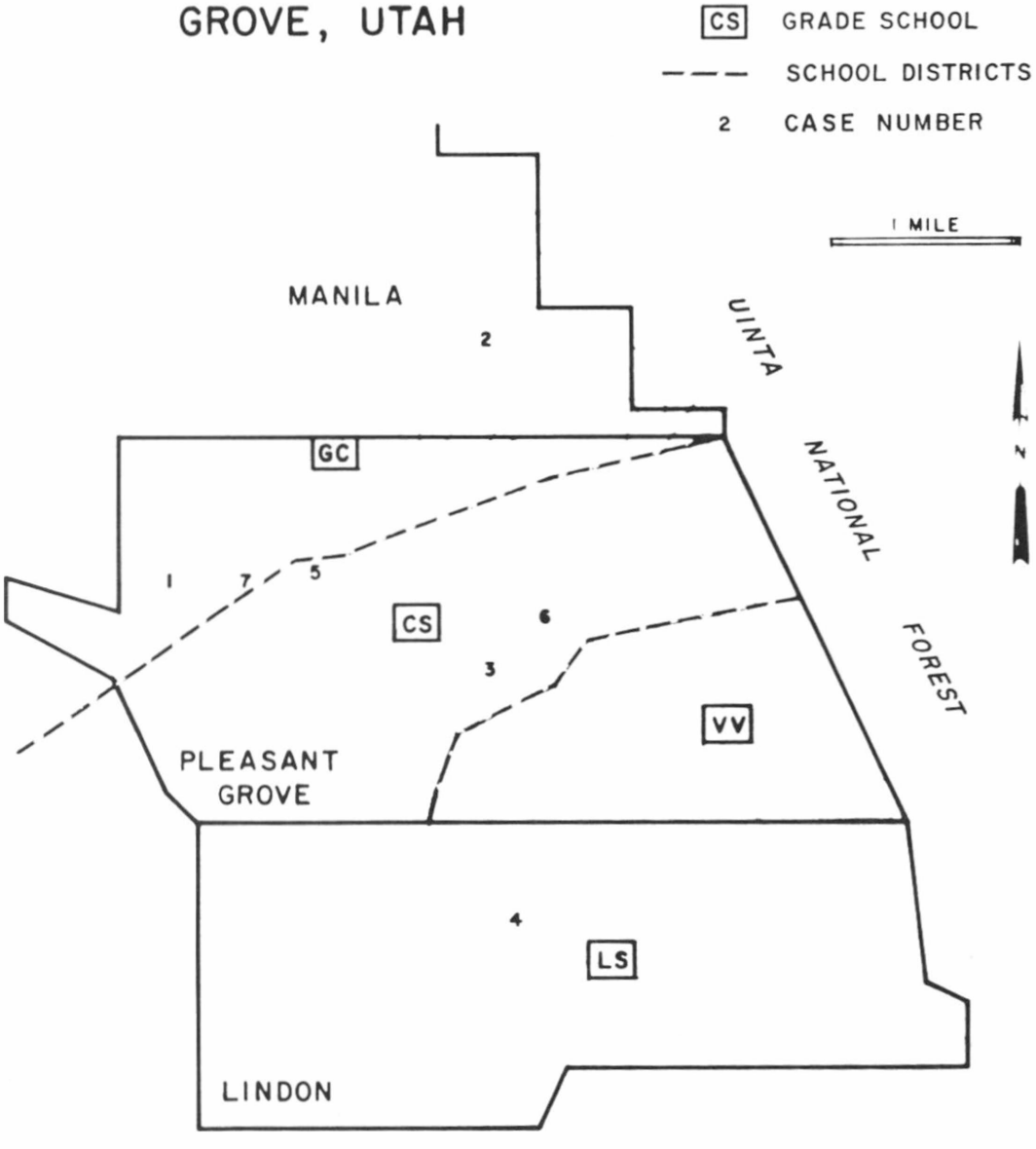
Six of the seven cases were in young children, and each was diagnosed as ALL. One case was diagnosed in 1959, one in 1965, three in 1967, and two in 1969 (Figure 2). Expected incidence, among children in the area was estimated to be about one case every 8 to 10 years.

Figure 2 **LEUKEMIA, PLEASANT GROVE, UTAH**



Although several of the eight families were acquainted, none were close friends. All seven childhood cases were from families in which one or more children attended elementary school, but no one school seemed unduly represented. Cases 1, 2, and 7 were associated with the GC school, while cases 3, 5, and 6 were associated with the CS school (Figure 3). These two schools handle the bulk of the area's elementary school enrollment. The one adult case affected a woman who lived in Lindon. She was very active in community affairs in the Pleasant Grove area, but had no children, and no especially close contact with the elementary schools.

Figure 3 LEUKEMIA, PLEASANT GROVE, UTAH



Investigation of this particular group of cases revealed little in the way of epidemiologic associations beyond the increased level of case incidence, and possibly a general association of childhood cases with elementary school attendance. When one considers how rare leukemia is, however, the occurrence of the 7th case in the course of the repeat investigation, seemed a startling coincidence.

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