The Effect of Ultraviolet Light upon Absenteeism from Upper Respiratory Infections in New Haven Schools*

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A STUDY of causes of absenteeism among New Haven school children has shown respiratory tract infections to be the major cause of absence for three or more consecutive school days.[1] In the present study, an attempt was made to control these diseases by ultraviolet irradiation of the upper air in classrooms.

Ultraviolet light is an effective bactericidal agent and has been used to control infection in operating rooms, pediatric and contagious disease wards, schools, military barracks, and children's institutions.[2] Nevertheless, considerably different energy concentrations are necessary to inhibit or kill various bacteria, fungi, and viruses[3, 4] and its effectiveness when relative humidity is over 50–60 per cent is controversial.[5–7] Small particles, such as droplet nuclei, are more susceptible to irradiation than larger particles, such as dust or lint.[2] Intensities of ultraviolet light necessary for germicidal effect are damaging to human skin and conjunctiva, thus restricting its use to upper air, ventilation ducts and barriers at entrances to rooms or isolation cubicles.[8] Furthermore, results reported to date have not always included information regarding the efficiency of the installations, completely adequate control populations and periods of observation or consideration of the problem of distinguishing between air-borne and contact infection and to what extent each was involved.

Various investigators[9–12] have shown that ultraviolet light may influence both the morbidity and the epidemic character of measles and chickenpox in experiments which included irradiation of whole school areas as well as common meeting places for children in the community. However, these results cannot be translated to other air-borne infections since continued study and observation in the field have not always accomplished prevention or modification in incidence of these diseases.[13, 14] A preliminary investigation by Wells, *et al.*, in Germantown (Pa.), suggested that ultraviolet irradiation may have a slight effect in decreasing the incidence of colds in a school population but the data were insufficient to warrant a conclusion.[9]

A two year investigation (1948–1950) of causes for absence from New Haven (Conn.) schools has shown respiratory tract infections (common cold, bronchitis, sinusitis, grippe, croup, influenza, bacterial or viral pneumonia, sore throat, pharyngitis, tonsillitis, etc.) to be the major cause of absence for three or more

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consecutive school days; during the school year 1948–1949, 62.7 per cent of 16,763 such absences and 51.6 per cent of 112,962 total days absence for the public and parochial school population of 25,606 were attributable to this disease category.[1] Statistics obtained from this report afford part of the control data in the present evaluation of the effect of ultraviolet irradiation of school rooms on absenteeism from respiratory tract infections. The cordial coöperation of the New Haven school authorities made this investigation possible.

Four methods have been used in attempts to control air-borne infections: (1) mechanical ventilation; (2) ultraviolet irradiation; (3) disinfectant vapors; and (4) dust suppression. The usually accepted criteria of effectiveness for these methods have been (a) reduction in total bacterial count of air, (b) reduced concentration in air of certain microörganisms usually found in the nasopharyngeal tract, and (c) reduced counts of certain pathogens, such as beta hemolytic streptococci or influenza virus A, when sprayed into a controlled atmosphere. These bacteriologic criteria, though helpful, are insufficient to demonstrate the effectiveness of various methods in reducing the incidence of disease in human populations living under natural conditions.

Diseases of the respiratory tract are spread through air as well as by contact.[2] The latter usually means both direct contact and also droplet infection, wherein transmission takes place by direct projection onto the mouth or conjunctiva. Air-borne contact includes transmission indirectly, by inhalation of droplet nuclei which remain suspended in the air of enclosed spaces for long periods of time, and transmission indirectly, by inhalation of larger particles from secondary reservoirs, e.g., floors, clothing or furniture.[15]

Ultraviolet light has a bactericidal effect primarily on droplet nuclei but has no appreciable effect when transmission occurs by direct contact or by droplet. The schoolroom has generally been considered an important focus for the transmission of communicable diseases, but the relative importance of contact versus air-borne transmission in the spread of various respiratory tract infections has not been fully evaluated. Since the common cold, bronchitis, sinusitis, grippe, croup, influenza, bacterial and viral pneumonia, sore throat, pharyngitis, tonsillitis, etc., are considered at least partially air-borne infections, control by ultraviolet irradiation seemed worthy of investigation. With the diagnostic data available, it was not feasible to categorize these diseases for purposes of this study.

The present study was limited to the effect of ultraviolet irradiation of upper air in schoolrooms on the incidence of respiratory infection, as evidenced by absence from school of three or more consecutive school days. Classrooms in eight of the 36 public grammar schools were irradiated: in two of these, all classrooms were treated; in six, a control group was contained within the school and ultraviolet equipment so located that approximately half the students of each age were in irradiated rooms; but kindergarten children could not be so divided and were excluded from study. These eight schools included kindergarten through grade six only; none had a lunchroom, auditoria were utilized primarily for class gymnasium sessions, and students remained in homerooms for practically all classes. These conditions pertain to all New Haven public schools. Populations of the remaining 28 schools, grouped according to socio-economic classification, served as control units for the eight experimental schools.

The child population of each New Haven public school is restricted to a definite surrounding area, thus allowing definition of each according to socio-economic status. Study by the Committee on the Hygiene of Housing of the American Public Health Association and the Neighborhood Planning Committee of the New Haven Council of Social Agencies [16, 17] has defined this status for the geographical areas of New Haven according to monthly rent, population density, available housing, numbers of children, percentage of older age groups, and numbers of white and Negro population into Groups I through V, Group I being optimal for these criteria. Residence restrictions do not apply in parochial schools and study was therefore limited to public schools.

The ultraviolet installation * was a wall-type unit with reflecting mirror and louvres which so directed rays that a beam of ultraviolet light transected the room at the height of the unit from the floor, for this study at 6.5 feet. The mirror projected some rays upward but the major effect was to produce a ceiling of ultraviolet light through the room atmosphere. Only insignificant irradiaation (less than 0.2 milliwatts per square foot) could be detected below the 6.5 foot level. Each irradiated room had three units of 30 watt capacity which produced a minimum intensity of 10 milliwatts per square foot throughout the ceiling of light and the control rooms in the six internally controlled schools had one unit with a fluorescent tube which produced a blue light but no rays in the ultraviolet spectrum.† Equipment was metered and cleaned every two weeks and was not disconnected at any time during the period of study.

All school personnel and parents were informed of the experiment but believed all rooms to be irradiated and the study based on variation in numbers of units. It is interesting that the few complaints from teachers concerning vague unpleasant effects of the rays were divided between those in irradiated and control rooms. No cases of conjunctivitis, erythema or desquamation in teachers or pupils were encountered during the treatment period.

Irradiation was begun during the last week in January, 1950, and tabulation of absenteeism in the treated schools started on February 1, 1950. The experiment extended over a period of 4½ months. A tabulation of the number of children absent with respiratory tract infections for each age group from September, 1949, through January, 1950, was used as control data in conjunction with the same information on these schools for the year 1948–1949. In addition, information on the remaining 28 New Haven schools for the years 1948–1950 was used to determine the possible importance of year-to-year variation in morbidity of respiratory tract infection and school-to-school variation within the same socio-economic level.

Table 1 tabulates populations in rooms treated with ultraviolet light and control groups by socio-economic level and age distribution. There is an internally controlled school in each socio-economic category, with two such schools in Group IV. There is a school with all classrooms treated in Group I and Group III. On the whole, distribution by age is reasonably comparable except for one, or at most two, age groups. An attempt was made to pair grades but such division was not always possible beyond the third grade. The small number of children age five in the first grade were included in age group six. Ages were as of November first in all studies. Kindergarten groups were excluded from all control data, as from the experiment, but the preponderance of pupils over age 12 in untreated schools reflects the inclusion in control material

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TABLE 1

Age Distribution in Eight Ultraviolet Irradiated and Twenty-eight Control Schools by Socio-Economic Status in New Haven Public Grade Schools (Less Kindergartens) 1949–1950

Socio-economic Status	*Schools*		*Number of Children by Age Groups*									
		6	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14+*	*Total*
I (highest)	Internal Controlled Irrad.	53	30	36	25	18	6	2	—	—	170
	Internal Controlled Control	34	35	20	31	28	21	2	—	—	171
	Internal Controlled Total	87	65	56	56	46	27	4	—	—	341
	U. V. All Classes	45	33	33	24	23	21	—	—	—	179
	Control Schools (2)	90	80	57	49	51	26	1	—	—	354
	Grand Total	222	178	146	129	120	74	5	—	—	874
II	Internal Controlled Irrad.	49	28	28	22	25	29	4	1	—	186
	Internal Controlled Control	68	43	25	36	22	23	17	7	—	241
	Internal Controlled Total	117	71	53	58	47	52	21	8	—	427
	Control Schools (6)	369	301	231	219	251	151	72	33	9	1,636
	Grand Total	486	372	284	277	298	203	93	41	9	2,036
III	Internal Controlled Irrad.	64	45	31	32	19	9	4	3	—	207
	Internal Controlled Control	77	40	38	29	39	34	8	—	—	265
	Internal Controlled Total	141	85	69	61	58	43	12	3	—	472
	U. V. All Classes	54	25	27	21	30	15	4	3	—	179
	Control Schools (10)	547	394	360	299	320	294	146	35	11	2,406
	Grand Total	742	504	456	381	408	352	162	41	11	3,057
IV	Internal Controlled Irrad.	58	24	28	5	11	37	18	—	—	181
	Internal Controlled Control	41	29	24	39	24	6	5	2	1	171
	Internal Controlled Total	99	53	52	44	35	43	23	2	1	352
	Self Controlled Irrad.	40	35	32	29	37	24	9	—	—	206
	Self Controlled Control	46	27	36	19	34	30	7	3	—	202
	Self Controlled Total	86	62	68	48	71	54	16	3	—	408
	Control Schools (5)	219	171	137	126	114	141	185	181	89	1,363
	Grand Total	404	286	257	218	220	238	224	186	90	2,123
V	Internal Controlled Irrad.	55	26	33	33	38	25	12	2	—	224
	Internal Controlled Control	52	57	41	28	24	15	11	4	2	234
	Internal Controlled Total	107	83	74	61	62	40	23	6	2	458
	Control Schools (4)	236	244	185	179	166	184	161	134	63	1,552
	Grand Total	343	327	259	240	228	224	184	140	65	2,010
	Self Controlled Irrad.	319	188	188	146	148	130	49	6	—	1,174
	Self Controlled Control	318	231	184	182	171	129	50	16	3	1,284
	Self Controlled Total	637	419	372	328	319	259	99	22	3	2,458
	U. V. All Classes	99	58	60	45	53	36	4	3	—	358
	Control Schools	1,461	1,190	970	872	902	796	565	383	172	7,311
	Great Grand Total	2,197	1,667	1,402	1,245	1,274	1,091	668	408	175	10,127

of seven grade schools with seventh and eighth grades. It is pertinent that the method of reporting illness (by school nurses or physicians) was an established routine of four years duration in the school health program and was not changed during this study.

Table 2 shows the number of cases prior and subsequent to February 1, 1950, for both treated and control populations in the six internally controlled schools and the lack of a significant difference between the two groups. Since age distribution in the treated and control portions of each school was reasonably comparable, this was eliminated as a factor. Other factors, such as variation in humidity, temperature, ventilation, and dust control affected both groups alike under conditions of this experiment. The room population in all New Haven schools varies between 25 and 35 pupils: less than 2 per cent of the total number of schoolrooms had more than 35 during the term of this study. There were no protracted periods of high humidity during this time. Lack of irradiation in halls and rest rooms may have detracted somewhat from the possible effectiveness of the ultraviolet treatment of classrooms; however, control of environment out-

TABLE 2

Irradiated and Control Population and Numbers of Cases of Respiratory Tract Infections Prior and Subsequent to February 1, 1950, in the Six Internal Controlled Schools, by Socio-Economic Status

Socio-economic Status	Study Groups	Population	Pretreatment Period (September–January) Cases	Per cent	Chi-Square	Treatment Period (February–June) Cases	Per cent	Chi-Square	Per cent Difference
	Control	171	90	52.6		120	70.2		17.6
I	Irradiated	170	112	65.9	6.20	130	76.5	1.72	10.6
	Control	241	38	15.8		78	32.4		16.6
II	Irradiated	186	34	18.3	0.47	46	24.7	2.96	6.4
	Control	265	95	35.8		99	37.4		1.6
III	Irradiated	207	57	27.5	3.67	58	28.0	4.57	0.5
	Control	171	61	35.7		56	32.7		—3.0
IV	Irradiated	181	80	44.2	2.66	73	40.3	2.20	—3.9
	Control	202	56	27.7		67	33.2		5.5
	Irradiated	206	63	30.6	0.40	57	27.7	1.45	—2.9
Total	Control	373	117	31.4		123	33.0		1.6
	Treated	387	143	37.0	2.63	130	33.6	0.03	—3.4
	Control	234	23	9.8		30	12.8		3.0
V	Irradiated	224	22	9.8	0.00	23	10.3	0.74	40.5
Grand Total	Control	1,284	363	28.3		450	35.0		6.7
	Irradiated	1,174	368	31.3	2.79	387	33.0	1.18	1.7

side the classroom was not feasible nor in line with the objectives of this investigation.

The number of susceptibles for each of the respiratory tract infections could not be ascertained; this estimation has been used in previous investigations when measles, chickenpox, and mumps were the air-borne diseases studied. It was considered, however, that the incidence of the four viral childhood diseases, i.e., measles, German measles, chickenpox, and mumps, in the preschool period might be used as an indication of the incidence of other air-borne, and to some extent, contact infections. Table 3 shows that, in representative samples of each socio-economic group which included the study schools in each group, there is a progressive increase in the percentage of children who had two or more of the viral childhood diseases in preschool life from the highest to the lowest socio-economic level. There was also, on the whole, a progressive decrease in incidence of absence for three or more consecutive school days from the highest to the lowest stratum. Differences were noted in the incidence of respiratory tract infections by socio-economic category in the 1948–1949 study of public school population [1]: 3.51 cases per 1,000 pupil days in Groups I and II combined; 3.05 cases in Group III; and 2.52 cases in Groups IV and V combined. Findings in the 1949–1950 evaluation, which excluded kindergartens, were similar: 4.7 cases per 1,000 pupil days in Groups I and II combined; 3.5 cases in Group III; and 2.7 cases in Groups IV and V combined. However, no significant difference with respect to socio-economic status in the efficacy of ultraviolet light in reducing the incidence of respiratory tract infection is noted.

TABLE 3

Number and Per Cent of Infections with Respiratory Tract Diseases and Number and Per Cent of Children with Two or More Preschool Infections (Measles, German Measles, Chickenpox, or Mumps) in Representative Samples of Public Schools in Each Socio-Economic Group, 1949–1950

Socio-economic Category	Incidence of Two or More Preschool Viral Diseases * Total Population	Two or more Diseases	Per cent	Respiratory Tract Disease † Total Population	No. Cases of U.R.I.	Per cent
I	902	275	30.5	804	937	116.5
II	1,099	402	36.6	960	670	69.8
III	1,648	745	45.2	1,344	1,078	80.2
IV	1,483	761	51.3	1,461	793	54.3
V	1,179	629	53.4	1,057	361	34.2

* As of June 1, 1949.
† September, 1949–June, 1950; minus kindergarten.

Table 4 shows the number of cases, days absence and average absence per case, before and after the experiment was initiated, in the six internally controlled schools and the two schools with all rooms irradiated, compared with figures for all other public grade schools on the same socio-economic level. A spot analysis of absences shows that the number of children absent more than once during either the period prior or subsequent to February 1, 1950, for the arbitrary three or more consecutive school days, because of respiratory tract disease was insignificant. It is also noted that no significant effect in average days of absence per case was produced in either treated or control

TABLE 4

Number of Cases, Total Days Absence, and Average Days Per Case for Irradiated and Control Schools by Socio-Economic Status, 1949–1950

Socio-economic Status	Study Groups	Pretreatment Periods (September–January) No. Cases	No. Days	Days per Case	Treatment Periods (February–June) No. Cases	No. Days	Days per Case
I	U. V. All Classrooms	70	329	4.7	112	602	5.4
	U. V. Internal Control	202	1,041	5.2	250	1,382	5.5
	Control	131	688	5.2	198	1,204	6.1
	Total	403	2,058	5.1	560	3,188	5.7
	U. V. Internal Control	72	382	5.3	124	664	5.4
II	Control	615	3,186	5.2	711	4,130	5.8
	Total	687	3,568	5.2	835	4,794	5.7
	U. V. All Classrooms	46	244	5.3	60	335	5.6
III	U. V. Internal Control	152	881	5.8	157	885	5.6
	Control	655	3,610	5.5	848	4,769	5.6
	Total	853	4,735	5.6	1,065	5,989	5.6
	U. V. Total Irradiation	260	1,368	5.3	253	1,310	5.2
IV	Control	293	1,537	5.2	324	1,710	5.3
	Total	553	2,905	5.2	577	3,020	5.2
	U. V. Internal Control	45	249	5.5	53	296	5.6
V	Control	361	2,026	5.6	436	2,282	5.2
	Total	406	2,275	5.6	489	2,578	5.3
Grand Total		2,902	15,541	5.4	3,526	19,569	5.6

TABLE 5

Total Population Cases of Respiratory Tract Infections and Per Cent Change After Initiation of Ultraviolet Irradiation in Eight Study Schools Compared to Control Schools for Each Socio-Economic Level, 1949–1950

	Treated Schools						Control Schools							
		A[1]		B[2]				A[1]		B[2]				
Socio-economic Status	Population	Cases	Per cent	Cases	Per cent	Per cent Difference	Population	Cases	Per cent	Cases	Per cent	Per cent Difference	Per cent Difference Between Treated and Control Schools	Relative Deviate *
I	341[3]	202	59.2	250	73.3	14.1	354	131	37.0	198	55.9	18.9	4.8	1.64
	179[4]	70	39.1	112	62.6	23.5	354	131	37.0	198	55.9	18.9	4.6	1.31
II	427[3]	72	16.9	124	29.0	12.1	1,636	615	37.6	711	43.5	5.9	6.2	4.43
III	472[3]	152	32.2	157	33.3	1.1	2,406	655	27.2	848	35.2	8.0	6.9	5.39
	179[4]	46	25.7	60	33.5	7.8	2,406	655	27.2	848	35.2	8.0	0.2	0.10
IV	760[3]	260	34.2	253	33.3	—0.9	1,363	293	21.5	324	23.8	2.3	3.2	6.67
V	458[3]	45	9.8	53	11.6	1.8	1,552	361	23.3	436	28.1	4.8	3.0	2.83
Total	2,816[3, 4]	847	30.1	1,009	35.8	5.7	7,311	2,055	28.1	2,517	34.4	6.3	0.6	1.13

1 Pretreatment Period (September–January)
2 Treatment Period (February–June)
3 Ultraviolet Internal Control
4 Ultraviolet Total Irradiation (Classrooms)

* A relative deviate of 2.5 or more equal to a probability of occurrence by chance of 1 per cent or less is considered statistically significant for the purpose of this study.

segments, nor was there any marked difference prior or subsequent to February 1, 1950. There is no difference in days of absence per case for the respiratory tract diseases in the five socio-economic levels. Analysis of the relative importance of the common cold, or bronchitis and pulmonary diseases, or throat and tonsillar infections in the five strata showed no significant change prior or subsequent to irradiation.

Table 5 shows that there was a significant decrease in the incidence of respiratory tract infections in internally controlled schools as compared to the untreated schools in socio-economic categories III, IV, and V. In category I there was no significant effect and in category II there was a significant increase in incidence. The schools with all classrooms irradiated in Groups I and III showed no significant changes when compared with control schools on their respective socio-economic levels. This table, and Table 6, seem to indicate only the variations which normally occur between schools of the same socio-economic status. Since the routine of school nurse or doctor seeing all children absent for three or more consecutive days has been in effect for four years, and since the caliber of school nurses, teachers, and principals has remained essentially the same, these factors are considered reasonably constant. There is, of course, variation in interest and degree of coöperation with the school health program from school to school, but periodic evaluation of the accuracy of these data showed that a minimum of 95 per cent of pupils absent for three or more consecutive school days were referred to the school nurse or doctor.

The crude rates in Tables 5 and 6 compare the eight schools studied, whether internally controlled or not, with all other schools, both by socio-economic status and with the group as a whole. The variation in incidence of absence for three or more consecutive days because of respiratory diseases is evident: there is a difference between schools in morbidity within a socio-economic category; incidence varies from one year to the next for a single school or a socio-economic group; in addition, the increase in respiratory diseases to be expected during the winter may not occur. These factors were suggested by preliminary data and indicated the desirability of both internal and external control groups.

Utilizing a standard population of 10,127 (total number of children studied), recalculation of the effect of ultraviolet irradiation in the eight experimental schools on the observed increase in absence from respiratory tract disease subsequent to initiation of treatment, as compared with the increase in the 28 control schools, shows that the "treated" population of 2,458 had an incidence increase of 5.0 per cent while this figure for the control group of 7,311 was 6.7 per cent. The difference, 1.7 per cent, has a relative deviate of 3.21 and is statistically significant. However, as applied to the control group, and assuming this difference to be due to ultraviolet irradiation, calculation shows that irradiation of rooms in 28 schools would have resulted in reducing the incidence of respiratory tract infection by only 43 cases—this is obviously of no practical significance.

The effect of ultraviolet irradiation on the incidence of measles, chickenpox, and mumps during the period of study could not be determined since the 1949–1950 school year was one of very low morbidity for the three childhood diseases.

SUMMARY

An attempt was made to control respiratory tract infections by ultraviolet irradiation of the upper air in classrooms of eight New Haven public grade schools. Control data were available on the remaining 28 public grade schools. Of the eight schools studied, all classrooms of two were irradiated by three 30

TABLE 6

Total Population, Cases of Respiratory Tract Infections and Per Cent Change Prior and Subsequent to February 1, 1949, in Eight Schools Irradiated During 1950 Compared to Schools Not Treated in 1950, by Socio-Economic Status, 1948–1949

Socio-economic Status	Treated Schools Population	Treated A[1] Cases	Treated A[1] Per cent	Treated B[2] Cases	Treated B[2] Per cent	Per cent Difference	Control Schools Population	Control A[1] Cases	Control A[1] Per cent	Control B[2] Cases	Control B[2] Per cent	Per cent Difference	Per cent Difference Between Treated and Control Schools	Relative Deviate *
I	345[3]	135	39.1	174	50.4	11.3	325	90	27.7	102	31.4	3.7	7.6	3.44
	177[4]	65	36.7	90	50.8	14.1	325	90	27.7	102	31.4	3.7	10.4	3.90
II	421[3]	109	25.9	167	39.7	13.8	1,599	446	27.9	673	42.1	14.2	0.4	0.21
III	443[3]	96	21.7	136	30.7	9.0	2,484	504	20.3	756	30.4	10.1	1.1	0.71
	176[4]	35	19.9	55	31.2	11.3	2,484	504	20.3	756	30.4	10.1	1.2	0.51
IV	758[3]	111	14.6	253	33.4	18.8	1,393	206	14.8	287	20.6	5.8	13.0	9.42
V	443[3]	73	16.5	62	14.0	−2.5	1,584	272	17.2	459	29.0	11.8	14.3	9.47
Total	2,763[3,4]	624	22.6	937	33.9	11.3	7,385	1,518	20.6	2,277	30.8	10.2	1.1	1.59

[1] September–January, 1948–1949
[2] February–June, 1949
[3] Ultraviolet irradiated, 1950-internal control
[4] Ultraviolet irradiated, 1950-all classrooms

* A relative deviate of 2.5 or more equal to a probability of occurrence by chance of 1 per cent or less is considered statistically significant for the purpose of this study.

watt ultraviolet lamps so that a ceiling of rays was constantly maintained at a 6.5 foot level; in the other six, where reasonably equal distribution of age groups into treated and control units was feasible, rooms containing approximately half the school population were similarly irradiated while all others were "treated" with blue light from fluorescent tubes which emitted no rays in the ultraviolet spectrum. Kindergartens were excluded from study. The populations of all schools were considered according to socio-economic status.

Tabulation of absence for three or more school days due to respiratory tract infections during the four and a half month period of irradiation in the six internally controlled schools showed no statistically significant effect from this procedure. No change was noted in the two schools with all classrooms irradiated as compared with control schools in their respective socio-economic groups. The crude data on populations in all eight experimental schools, when compared with those for all untreated schools in the same economic strata, for periods prior and during irradiation, showed variable effects on absentee rates due to respiratory tract infections. A statistically significant difference was observed when the data were recalculated on the basis of a standard population; however, the reduction in actual number of cases was too small to be of practical significance. Information on the natural variation in incidence of respiratory tract diseases for individual schools as well as socio-economic groups is presented and discussed. Effects on the incidence of measles, chickenpox, and mumps could not be evaluated.

Ultraviolet irradiation of classrooms, under the conditions of this experiment with New Haven grade school populations, showed varying results in affecting the incidence of respiratory tract infections which ranged from a statistically significant increase in these diseases to the reverse when populations of eight schools studied were compared with control groups in schools of their respective socioeconomic levels. This study emphasizes some of the difficulties inherent in evaluation of methods for the control of air-borne infections in school populations.

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