TONSILLECTOMY AND RESPIRATORY ILLNESS IN THE POPULATIONS OF TWO COMMUNITIES IN NEW YORK STATE

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IN 1868, Mayer of Copenhagen introduced the operation for the removal of the adenoid. Since that time the tonsil and adenoid operation has increased in frequency until it is now one of the most common surgical operations (1). Kaiser, in commenting on the frequency of the operation, said "Whatever influences may have been responsible for bringing about the present attitude toward the tonsils and adenoids, it must be recognized that surgery of the tonsils has been widely accepted as both a therapeutic and a prophylactic procedure" (2).

The study of acute respiratory illness that was conducted in two communities, Pleasantville and Mt. Kisco, in Westchester County, New York, from September, 1946 to June, 1949 included records on tonsillectomies in those populations. The purpose of this paper is to present data on the respiratory illness experience of persons with tonsils present and of persons with tonsils removed.

DATA AND METHOD OF STUDY

The data and method of the study of respiratory illness in the two communities in Westchester County, New York, have been fully described in previous reports (3, 4). Briefly, the periodic survey of families for the purpose of collection of illness records was the method employed in this study. All families in which there were one or more children attending grade school or high school in each of the two communities were included. These families were visited every twenty-eight days during three school years, September to June, 1946–1949. On each visit to the family, inquiry was made about acute respiratory illnesses which had occurred among their members during the past four weeks.

The weekly incidence of acute respiratory illness was fairly similar in both communities in each study year (3, 4). In this

[1] From the Milbank Memorial Fund. This is the tenth in a series of papers dealing with acute respiratory illness.

analysis, therefore, the morbidity experience over the three years has been combined for each community.

A description of the two communities also has been presented in previous reports (3, 4). The mean number of families visited during the three years of the study was 530 in Pleasantville and 570 in Mt. Kisco. The two communities were similar with respect to the age distribution of the study population and the median size of family. The data presented in this report represent the combined experience of the two communities.

The population is composed of the persons in both communities counted in each year that they were observed. Thus the rates obtained represent an average nine-month incidence over three school years.

Frequency of Tonsillectomy

On the initial visit to the family, inquiry was made concerning the presence or absence of tonsils for each person in the household. The age at which tonsillectomy occurred was recorded for persons with tonsils removed. Tonsillectomies which occurred during the study were also recorded. No record was made of adenoidectomies unless the tonsils were also removed.

Tonsillectomy by Occupational Class of Head of Household. Figure 1 and Appendix Table 1 show the proportion of persons with tonsils removed, classified by age and the occupational class of the head of the household.[2] Two hundred and seventeen persons who had a tonsillectomy during the study were excluded in the particular year in which the tonsillectomy occurred. Two hundred and three persons or 3 per cent of the 6,374 total persons who were observed at some time during the three years of the study have been excluded because it was unknown whether their tonsils were present or removed. From the data presented in the left section of Figure 1, it appears that economic status had an effect in determining the occurrence of tonsillectomy. At each age a greater proportion of the total persons in the professional and managerial class had their tonsils removed than in either the clerical and skilled or semi-skilled

[2] Coding of occupational class was based upon the Alphabetical Index of Occupations and Industries. United States Department of Commerce, Bureau of the Census, Sixteenth Census of the United States, 1940.

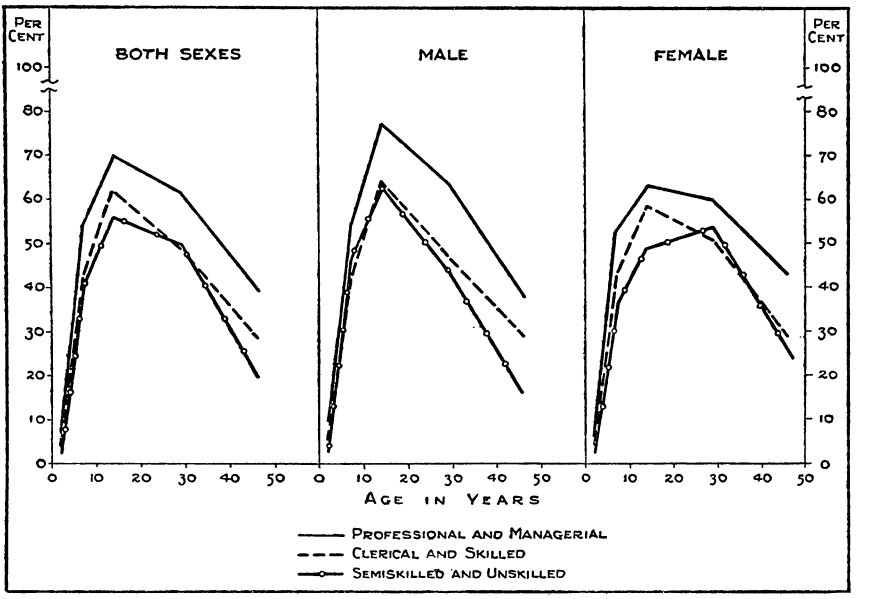

Fig. 1. Per cent of persons with tonsils removed classified by age, sex, and the occupational class of the head of the household. Pleasantville and Mt. Kisco, 1946–1949.

and unskilled classes.[3] In a study of tonsillectomies in two counties in Florida and one in Missouri, Collins also reported differences in the proportion of children in the different occupational classes who had their tonsils removed. He noted that "The rates in the unskilled group are generally one-third to one-half of what they are in the professional and salaried class" (5). In the Westchester study the rates for children in the semi-skilled and unskilled class were three-quarters of what they were for children whose fathers were in the professional and managerial class.

Age. The left section of Figure 1 also shows the proportion of persons at different ages who had had a tonsillectomy. The proportion of tonsillectomized children increased with age from

[3] When the data for persons of all ages in the clerical and skilled and semi-skilled and unskilled classes combined were compared with data for the professional and managerial class, the difference in the proportion of persons with tonsils removed was significant at the .05 level of confidence. The standard error of the difference between per cents was computed and the value for "t" was obtained by computing the ratio of the difference between per cents to the standard error of the difference between the per cents. The formula is:

$$\sigma d = \sqrt{PQ\left(\frac{1}{n1} + \frac{1}{n2}\right)} \qquad t = \frac{10.9225}{.8619} = 12.6726$$

less than 8 per cent in the 0–4 year-age group to from 56 to 70 per cent in the 10–18 year-age group. After age 18 the proportion of the total persons who had had a tonsillectomy decreased as age increased. Forty-nine to 62 per cent of the adults aged 19 to 39 and only 20 to 40 per cent of the adults aged 40 and older had had a tonsillectomy.

The data shown in the left section of Figure 1 corroborate the fact that the removal of tonsils has become more frequent than in past years. The highest proportion of persons with tonsils removed was in the 10–18 year-age group.

Sex. The center section of Figure 1 shows the proportion of males at specific ages who had had a tonsillectomy and the right section of Figure 1 shows the same data for females. In this study a greater proportion of male children in each occupational class had tonsillectomies than female children. This sex difference is especially marked in the 10–18 year-age group. Seventy-seven per cent of the males in the professional and managerial class compared with 63 per cent of the females had had tonsillectomies; 64 per cent and 59 per cent, respectively, in the clerical and skilled class; and 63 per cent and 49 per cent, respectively, in the semi-skilled and unskilled class. This sex difference among children in the frequency of tonsillectomy has been noted in other studies of school-aged children (6–9). Among adults a slightly greater proportion of the females in the two communities in Westchester County had had tonsillectomies. When all ages are combined, however, the difference between the sexes in the proportion of persons which had a tonsillectomy disappears. This is true of those in each occupational class.[4]

Incidence of Acute Respiratory Illness

Acute respiratory illnesses presented in this report include head colds or coryza, colds with sore throat, tonsillitis and septic sore throat, colds with chest involvement such as tracheitis and bronchitis, and influenza or grippe. Figure 2 shows the distri-

	Per Cent With Tonsillectomy	
	Male	*Female*
[4] Professional and Managerial	51.8	50.9
Clerical and Skilled	41.1	42.4
Semi-Skilled and Unskilled	37.7	40.1

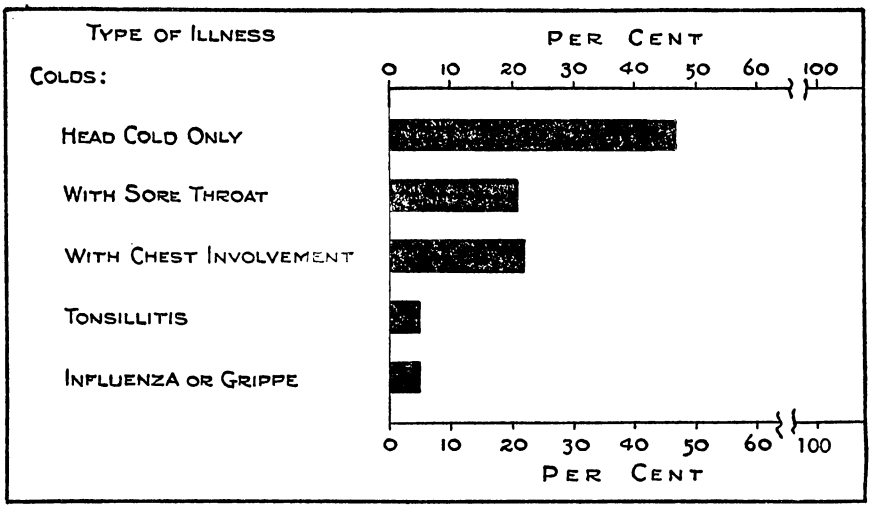

Fig. 2. Distribution of acute respiratory illnesses classified by type of illness. Pleasantville and Mt. Kisco, September to June, 1946–1949.

bution of these reported illnesses in order of their severity. Head colds accounted for 47 per cent of the total illness; colds with sore throat, 21 per cent; colds with chest involvement, 22 per cent; tonsillitis and septic sore throat, 5 per cent; and influenza or grippe, 5 per cent. Cases of asthma, intestinal influenza or grippe, tonsillectomies and mastoidectomies have been excluded.

Nearly 50 per cent of the children under 19 years of age in the Pleasantville and Mt. Kisco families had had a tonsillectomy. Kaiser found a similar proportion of tonsillectomized children in his studies and stated his skepticism of such widespread tonsillectomy saying, "Where this procedure is applied to 50 per cent of the children during their school years, it seems reasonable to question whether the tonsils can be incriminated in such a high percentage of children and whether surgical treatment of the tonsils in these children contributes anything to their health" (2).

In order to study the association of tonsillectomy and the incidence of acute respiratory illness, the population observed in the Westchester study was divided into two groups: (1) those whose tonsils were removed before the study began, and (2) those who had no tonsillectomy before or during the study. Table 1 and Appendix Table 2 show the incidence of

Occupational Class of Head of Household	Male		Female	
	Tonsils Present	Tonsils Removed	Tonsils Present	Tonsils Removed
	Rate per 1,000 Population			
	Age 5–9			
Professional and Managerial	2,537	2,647	2,614	2,988
Clerical and Skilled	2,124	2,171	2,092	2,160
Semiskilled and Unskilled	2,019	1,820	1,778	2,110
	Age 10–18			
Professional and Managerial	1,389	1,654	1,593	1,889
Clerical and Skilled	1,201	1,474	1,333	1,856
Semiskilled and Unskilled	838	1,125	1,173	1,329
	Age 19–39			
Professional and Managerial	1,050	1,136	1,451	1,598
Clerical and Skilled	653	755	1,104	1,235
Semiskilled and Unskilled	488	608	890	1,013
	Age 40+			
Professional and Managerial	738	1,042	934	1,412
Clerical and Skilled	654	890	940	1,282
Semiskilled and Unskilled	400	650	736	1,054

Table 1. Incidence of acute respiratory illness among persons classified by age, sex, occupational class of the head of the household, and whether tonsils were present or removed. Pleasantville and Mt. Kisco, 1946–1949.

acute respiratory illness by age, sex, and the occupational class of the head of the household for persons with tonsils present and persons with tonsils removed.[5] In each occupational class, sex, and age group under 40 the incidence of reported illness was similar among persons with tonsils present and persons with tonsils removed. Among adults aged 40 and over, persons with tonsils removed had a higher incidence of respiratory illness than persons with tonsils present.

Incidence of Tonsillitis and Septic Sore Throat

In both Pleasantville and Mt. Kisco, tonsillitis and septic

[5] Persons under 5 years of age have been omitted from these data because less than 8 per cent of them had had a tonsillectomy.

Occupational Class of the Head of the Household	Tonsils Present	Tonsils Removed	Ratio Tonsils Present / Tonsils Removed
	Rate Per 1,000 Population		
	Age 5–18		
Professional and Managerial	90.8	54.7	1.66
Clerical and Skilled	87.7	48.9	1.79
Semiskilled and Unskilled	48.8	28.6	1.71
	Age 19+		
Professional and Managerial	14.3	38.3	0.37
Clerical and Skilled	24.2	23.3	1.04
Semiskilled and Unskilled	20.6	19.1	1.08

Table 2. Incidence of tonsillitis and septic sore throat among persons classified by the occupational class of the head of the household, age, and whether tonsils were present or removed. Pleasantville and Mt. Kisco, 1946–1949.

sore throat accounted for 3 per cent of the total acute respiratory illness reported for persons 5 years of age and over during the three years of the study. The incidence of tonsillitis and septic sore throat is shown in the first two columns of Table 2 and in Appendix Table 3 for persons classified by age, the occupational class of the head of the household, and whether tonsils were present or removed. The third column of Table 2 shows the ratio of the incidence among persons with tonsils present to the incidence among persons with tonsils removed. In the 5 to 18 year-age group, children with tonsils present had from 66 to 79 per cent more tonsillitis and septic sore throat than did children with tonsils removed. Among adults aged 19 and over the incidence of tonsillitis and septic sore throat was similar in the tonsil-present and the tonsil-removed groups with the exception of adults in the professional and managerial class.

Incidence of Acute Respiratory Illness by Selected Indices of Severity

Illnesses were classified according to disability to study whether the severity of attacks of acute respiratory illness dif-

Occupational Class of Head of Household	Male		Female	
	Tonsils Present	Tonsils Removed	Tonsils Present	Tonsils Removed
	Rate per 1,000 Population			
	Age 5–9			
Professional and Managerial	1,920	1,932	1,958	2,270
Clerical and Skilled	1,534	1,530	1,444	1,472
Semiskilled and Unskilled	1,212	1,236	1,111	1,500
	Age 10–18			
Professional and Managerial	893	1,031	1,036	1,290
Clerical and Skilled	728	872	847	1,048
Semiskilled and Unskilled	593	646	636	746
	Age 19–39			
Professional and Managerial	322	399	388	528
Clerical and Skilled	208	255	401	450
Semiskilled and Unskilled	188	186	289	291
	Age 40+			
Professional and Managerial	284	382	336	403
Clerical and Skilled	210	356	292	373
Semiskilled and Unskilled	120	300	271	280

Table 3. Incidence of disabling attacks of acute respiratory illness among persons classified by age, sex, the occupational class of the head of the household, and whether tonsils were present or removed. Pleasantville and Mt. Kisco, 1946–1949.

fered between the tonsil-present and tonsil-removed groups. A disabling illness was defined as an illness which caused an interruption in usual daily work or activities.

Table 3 and Appendix Table 4 show the incidence of disabling acute respiratory illness classified by age, sex, the occupational class of the head of the household, and the presence or absence of tonsils. In each occupational class, sex, and age group under 40 the incidence of disabling illness was similar among persons with tonsils removed and those with tonsils present. The similarity was especially marked in the 5 to 9 year-age group. After age 40, males with tonsils removed had

Occupational Class of Head of Household	Tonsils Present	Tonsils Removed
	Rate Per 1,000 Population	
	age 5–9	
Professional and Managerial	10,092	11,213
Clerical and Skilled	8,865	7,870
Semiskilled and Unskilled	6,641	9,351
	age 10–18	
Professional and Managerial	4,029	4,746
Clerical and Skilled	3,358	3,970
Semiskilled and Unskilled	2,339	2,734
	age 19+	
Professional and Managerial	1,645	2,073
Clerical and Skilled	1,572	2,021
Semiskilled and Unskilled	1,123	658

Table 4. Incidence of disabled days of acute respiratory illness among persons classified by age, the occupational class of the head of the household, and whether tonsils were present or removed. Pleasantville and Mt. Kisco, 1946–1949.

a higher incidence of disabling illness. Among females aged 40 and over the incidence of disabling illness among persons with tonsils present and persons with tonsils removed was more nearly similar.

It may be that the presence or absence of tonsils may affect the duration of disabling illness. Table 4 and Appendix Table 5 show the incidence of disabling days of acute respiratory illness for persons with tonsils present and persons with tonsils removed, classified by age and the occupational class of the head of the household. There was a similarity in the incidence of disabling days for the tonsil-present and tonsil-removed groups at each age. This was true of the three occupational classes. Persons with tonsils removed generally had both an incidence of disabling illness and an incidence of disabling days similar to that noted for the tonsil-present group.

Gafafer made two studies of adults during 1929 and 1930 in order to determine the association between the presence or absence of tonsils and the severity of attacks of upper respiratory

Table 5. Frequency of certain indices of severity in attacks of acute respiratory illness among adults.[1]

Index of Severity	Tonsils Present			Tonsils Removed		
	Pleasantville and Mt. Kisco[2]	Gafafer No. 1[3]	Gafafer No. 2[4]	Pleasantville and Mt. Kisco[2]	Gafafer No. 1[3]	Gafafer No. 2[4]
	Per Cent					
Confined to Bed	23.8	12.0	12.3	24.3	14.6	14.3
Aching	25.5	15.6	15.4	27.0	13.9	14.1
Fever	18.2	22.1	22.2	18.7	23.5	20.1
Duration 10+ Days	40.6	53.6	56.5	41.2	58.9	61.5
Total Number of Cases	3,265	276	324	3,421	156	377

[1] The Gafafer studies include attacks of upper respiratory disease (common cold with the symptoms of coryza, cough, and sore throat. The Pleasantville-Mt. Kisco study includes coryza and illnesses with sore throat or chest involvement, such as tracheitis, bronchitis, and cough.

[2] Based on 6,950 adults aged 19+ (3,966 having tonsils present and 2,984 having tonsils absent) observed from September to June, 1946–1949.

Based on 179 adults aged 17–48 (123 having tonsils present and 56 having tonsils absent) observed from September, 1929 to June, 1930.

Based on 275 adults aged 17–59 138 having tonsils present and 137 having tonsils absent) observed from September, 1929 to June, 1930.

illness (the common cold). He selected four indices of severity: in bed, general aching, fever, and duration of ten or more days (10, 11). Table 5 shows the proportion of the total cases of acute respiratory illness among adults which were accompanied by these indices of severity for the Westchester study and Gafafer's two studies. The proportion of cases confined to bed, with general aching, with fever, and with duration of 10+ days are very similar between the tonsil-present and tonsil-removed groups in both the Westchester study and those made by Gafafer.

Gafafer found that "The group with tonsils and adenoids and the group without tonsils and adenoids presented no significant difference with respect to (1) frequency, (2) severity, or (3) type of attack of disease of the upper respiratory tract (common cold)" (10, 11). Kaiser's conclusion after consideration of the data from a ten-year follow-up study of tonsillectomized children was "Acute head colds and otitis media, though definitely lessened over a three-year period, are not essentially influenced over a ten-year follow-up period" (12). In the study in Pleasantville and Mt. Kisco the incidence of respiratory illness among persons with tonsils present and persons with tonsils removed was similar for the two groups of persons for each sex and in each occupational class up to age 40. After age 40 persons with tonsils removed had a higher incidence of acute respiratory illness when compared to persons whose tonsils had not been removed.

Summary

This paper has presented data on the incidence of acute respiratory illness in two groups of persons, those with tonsils present and those with tonsils removed, who were observed in two communities in Westchester County, New York, for three school years, September to June, 1946–1949.

The frequency of tonsillectomy was shown by the occupational class of the head of the household, and by the age and sex of the persons under observation. At each age a greater proportion of the total persons in the professional and managerial class had had their tonsils removed than in either the clerical and skilled or semi-skilled and unskilled classes. The

proportion of tonsillectomized children increased with age up to 18 years. After age 18 the proportion of the total persons who had had a tonsillectomy decreased as age increased. In the 10 to 18 year-age group, from 56 to 70 per cent of the children had had their tonsils removed. The data corroborate the fact that the removal of tonsils has become more frequent than in past years. In this study a greater proportion of male children in each occupational class had had tonsillectomies than female children. This sex difference among children in the frequency of tonsillectomy has been noted in other studies of school-aged children.

In each occupational class, sex, and age group under 40 the incidence of acute respiratory illness was similar among persons with tonsils present and persons with tonsils removed. After age 40 the incidence of illness among persons with tonsils removed was higher than for persons with tonsils present.

The incidence of tonsillitis and septic sore throat was from 66 to 79 per cent higher among children 5–18 with tonsils present compared to children of the same age with tonsils removed. Among adults aged 19 and over the incidence of tonsillitis and septic sore throat was similar in the tonsil-present and tonsil-removed groups with the exception of adults in the professional and managerial class.

In each occupational class, sex, and age group under 40 the incidence of disabling acute respiratory illness was similar among persons whose tonsils were removed and persons with tonsils present. After age 40, males with tonsils removed had a higher incidence of disabling illness. Among females aged 40 and over the incidence of disabling illness among persons with tonsils present and persons with tonsils removed was more nearly similar.

Among adults the severity of respiratory illness was similar for persons with tonsils present and persons with tonsils removed. Four indices of severity were used: in bed, general aching, fever, and duration of ten or more days. These indices of severity were similar in frequency between the tonsil-present and tonsil-removed groups in the Westchester study and between the two groups in two studies reported upon by Gafafer.

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Appendix Table 1. Population with tonsils removed, classified by the occupational class of the head of the household, and by sex and age.[1,2] Pleasantville and Mt. Kisco, 1946–1949.

Age in Years and Sex	Occupational Class of the Head of the Household								
	Professional and Managerial			Clerical and Skilled			Semi-Skilled and Unskilled		
	Total	Tonsils Removed	Per Cent Removed	Total	Tonsils Removed	Per Cent Removed	Total	Tonsils Removed	Per Cent Removed
Both Sexes									
All Ages	5,573	2,860	51.3	3,898	1,627	41.7	3,469	1,349	38.9
0–4	496	37	7.5	346	15	4.3	275	5	1.8
5–9	868	465	53.6	526	223	42.4	419	171	40.8
10–18	1,248	869	69.6	932	574	61.6	880	493	56.0
19–39	1,365	846	62.0	1,035	510	49.3	1,020	507	49.7
40+	1,596	643	40.3	1,059	305	28.8	875	173	19.8
Male									
All Ages	2,661	1,379	51.8	1,959	805	41.1	1,715	646	37.7
0–4	238	22	9.2	192	9	4.7	144	3	2.1
5–9	409	221	54.0	278	117	42.1	193	89	46.1
10–18	576	445	77.3	473	304	64.3	447	280	62.6
19–39	563	361	64.1	448	212	47.3	444	194	43.7
40+	875	330	37.7	568	163	28.7	487	80	16.4
Female									
All Ages	2,912	1,481	50.9	1,939	822	42.4	1,754	703	40.1
0–4	258	15	5.8	154	6	3.9	131	2	1.5
5–9	459	244	53.2	248	106	42.7	226	82	36.3
10–18	672	424	63.1	459	270	58.8	433	213	49.2
19–39	802	485	60.5	587	298	50.8	576	313	54.3
40+	721	313	43.4	491	142	28.9	388	93	24.0

[1] Excludes 44 persons of unknown age.
[2] Excludes 267 persons unknown as to tonsillectomy, 255 of whom were in the 19+ age group. These persons were counted as exclusions in each year they were observed.

Appendix Table 2. Number of acute respiratory illnesses among persons classified by age, sex, occupational class of the head of the household, and whether tonsils were present or removed. Pleasantville and Mt. Kisco, 1946–1949.

Occupational Class of Head of Household	Male		Female	
	Tonsils Present	Tonsils Removed	Tonsils Present	Tonsils Removed
	age 5–9			
Professional and Managerial	477	585	562	729
Clerical and Skilled	342	254	297	229
Semiskilled and Unskilled	210	162	256	173
	age 10–18			
Professional and Managerial	182	736	395	801
Clerical and Skilled	203	448	252	501
Semiskilled and Unskilled	140	315	258	283
	age 19–39			
Professional and Managerial	212	410	460	775
Clerical and Skilled	154	160	319	368
Semiskilled and Unskilled	122	118	234	317
	age 40+			
Professional and Managerial	402	344	381	442
Clerical and Skilled	265	145	328	182
Semiskilled and Unskilled	163	52	217	98

Appendix Table 3. Number of attacks of tonsillitis and septic sore throat among persons, classified by the occupational class of the head of the household, age, and whether tonsils were present or removed. Pleasantville and Mt. Kisco, 1946–1949.

Occupational Class of Head of Household	Tonsils Present	Tonsils Removed
	age 5–18	
Professional and Managerial	71	73
Clerical and Skilled	58	39
Semiskilled and Unskilled	31	19
	age 19+	
Professional and Managerial	21	57
Clerical and Skilled	31	19
Semiskilled and Unskilled	25	13

Occupational Class of Head of Household	Male		Female	
	Tonsils Present	Tonsils Removed	Tonsils Present	Tonsils Removed
	age 5–9			
Professional and Managerial	361	427	421	554
Clerical and Skilled	247	179	205	156
Semiskilled and Unskilled	126	110	160	123
	age 10–18			
Professional and Managerial	117	459	257	547
Clerical and Skilled	123	265	160	283
Semiskilled and Unskilled	99	181	140	159
	age 19–39			
Professional and Managerial	65	144	123	256
Clerical and Skilled	49	54	116	134
Semiskilled and Unskilled	47	36	76	91
	age 40+			
Professional and Managerial	155	126	137	126
Clerical and Skilled	85	58	102	53
Semiskilled and Unskilled	49	24	80	26

Appendix Table 4. Disabling attacks of acute respiratory illness among persons classified by age, sex, occupational class of the head of the household, and whether tonsils were present or removed. Pleasantville and Mt. Kisco, 1946–1949.

Occupational Class of Head of Household	Disabled Days	
	Tonsils Present	Tonsils Removed
	age 5–9	
Professional and Managerial	4,067	5,214
Clerical and Skilled	2,686	1,755
Semiskilled and Unskilled	1,647	1,599
	age 10–18	
Professional and Managerial	1,527	4,124
Clerical and Skilled	1,202	2,279
Semiskilled and Unskilled	905	1,348
	age 19+	
Professional and Managerial	2,422	3,086
Clerical and Skilled	2,010	1,647
Semiskilled and Unskilled	1,364	898

Appendix Table 5. Disabled days of acute respiratory illness among persons classified by age, the occupational class of the head of the household, and whether tonsils were present or removed. Pleasantville and Mt. Kisco, 1946–1949.