

As a part of a comprehensive, prospective epidemiological study of an entire community, attention has been given to symptoms of respiratory illness, impairment of pulmonary function, and smoking. The results of this investigation show these variables to be related. The significance of the findings is discussed, and points for further study are indicated.

RESPIRATORY SYMPTOMS, LUNG FUNCTION, AND SMOKING HABITS IN AN ADULT POPULATION

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IN RECENT years there has been a great deal of interest in chronic nonspecific respiratory disease and, particularly, in the use of epidemiological methods to identify factors of importance in the development and progress of chronic bronchitis, emphysema, and related disorders. Because of difficulties in defining disease and establishing acceptable diagnostic criteria, attention has been focused on symptoms of respiratory disease.¹⁻⁴ British workers have developed a technic for eliciting relevant information in a standard manner by means of a questionnaire.⁵⁻⁷ Adults in Tecumseh, Mich., have been asked questions from an early version of the approved questionnaire and the purpose of this paper is to report on respiratory symptoms, ventilatory function, and smoking habits in that population.

Tecumseh is the site of a comprehensive, prospective epidemiological investigation of an entire community; the aims, scope, and conduct of the study have been described by Francis⁸ and Epstein.⁹ An attempt is being made to identify factors which are relevant to maintenance of health and resistance to disease on the one hand, and to susceptibility to disease and its origin and manifestation on the other. Observations will be made over a period of

years and the entire population characterized with regard to constitutional and environmental factors, as well as experience of health and disease.

In such a comprehensive study, it is scarcely possible or desirable to pursue all approaches simultaneously or with equal intensity. In the initial phase of the Tecumseh study attention has been focused on cardiovascular disease, diabetes, rheumatic and joint disorders, and chronic respiratory disease.

Method

In 1957 the study population was identified by census and stratified by area of residence. The entire population was then randomly allotted by households into ten samples. Interviews and examinations proceeded sample by sample. Field methods and response rates have been described by Napier.¹⁰

Tecumseh is a town of about 6,500 people, and the study population consists of these residents together with some 3,000 people living in the surrounding rural area. There are several small industries and one large factory where compressors for refrigerators are made; Tecumseh also provides services for the surrounding farm area.

The first series of interviews and

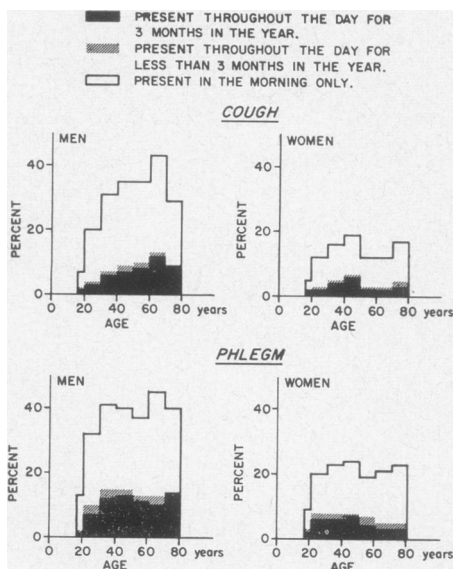


Figure 1—The Prevalence of Cough and Phlegm in the Adult Population, Tecumseh, 1959-1960

examinations was begun in March, 1959, and completed 18 months later; the following data were collected during this time. Trained lay interviewers visited the residents in their homes, explained the nature of the study, and completed standard questionnaires. Information was sought about past and present disease, and a brief inquiry was made about the use of tobacco and alcohol, national origin, and present or past employment. A family history was obtained for relatives not living in the study area. Appointments were made for residents to attend a special clinic established in the local hospital.

At the clinic physicians reviewed and supplemented the medical and family histories and did physical examinations. Laboratory investigations included electrocardiograms, simple tests of ventilatory function, chest x-rays of all adults, a number of blood tests, and urinalysis. Anthropometric measurements such as sitting and standing height, weight, and skin fold thickness were made. The

examining physicians completed diagnostic summaries indicating diseases which they thought patients had now or had had in the past. All the information was then reviewed by staff physicians who sent reports to private doctors and assigned diagnoses in the light of all the clinical and laboratory evidence.

Results

Eighty-seven per cent of the males and 89 per cent of the females cooperated fully and were interviewed and examined; another 5 per cent of each sex answered the interviewers' questions but were not willing to attend the clinic. Of the 8,641 people who were examined, 59 per cent were over 16 years of age, and it is on these 5,140 adults that this report is based.

Respiratory Symptoms

Cough and Phlegm

All adults were asked two basic questions about cough and phlegm—namely, "Do you cough at all when you get up or first thing in the morning?" and "Do you bring up any phlegm when you get up or first thing in the morning?" Those who admitted to either cough or phlegm were asked whether the symptoms persisted during the rest of the day, and if they did, whether they occurred on most days for as much as three months in the year. Those reporting phlegm were asked about its color and about the occurrence of bouts of cough and phlegm lasting three weeks or more each winter. On the basis of replies to these questions the population has been characterized with regard to the presence of cough and phlegm considered separately and in combination.

The prevalence of cough and the prevalence of phlegm are shown in Figure 1. Both symptoms were reported more commonly by men than women; in

fact, 29 per cent of the men and 14 per cent of the women reported cough and 36 per cent of the men and 21 per cent of the women said they had phlegm. The prevalence of cough increased with age in men up to 69 years and in women up to 49 years, but there was very little change in the prevalence of phlegm with increasing age after the third decade. There was, of course, considerable overlap with 21 per cent of the men and 10 per cent of the women reporting both symptoms. It was surprising that as many as 15 per cent of the men and 11 per cent of the women denied cough but reported phlegm. Fletcher⁴ has suggested that this may be attributed to phlegm being raised without effort, but since we did not stress that phlegm should come from the chest it is also possible that some of these people cleared their throats of post-nasal discharge.

In subsequent analyses the population has been divided into three groups: those with neither cough nor phlegm, comprising 56 per cent of the men and 75 per cent of the women; those with cough and phlegm Grade I; and those with cough and phlegm Grade II. Persons with Grade II symptoms had both cough and phlegm of which at least one was present throughout the day on most days for as much as three months in the year; persons with Grade I cough and phlegm had either or both symptoms to a lesser degree. Grade II symptoms were therefore more severe, known to be persistent, and probably indicated involvement of the lower respiratory tract. The prevalences of Grades I and II cough and phlegm by age and sex are shown in Table 1.

Grade I symptoms were more common and present in 36 per cent of the men and 22 per cent of the women. The preponderance of males was more marked with regard to Grade II symptoms, 8 per cent of the men and 4 per cent of the women being in this cate-

gory. The prevalence of Grade II symptoms increased with advancing age in men and in women up to 49 years, but Grade I symptoms showed little change in frequency after 19 years of age in either sex. In the following comparisons the age range has been restricted to 20-69 years because of the small number of persons in some of the subgroups at both extremes of the age range.

Since interviewing continued over a period of 18 months it was important to know whether the season at the time of interview was related to the frequency with which cough and phlegm were reported. The prevalences of Grades I and II cough and phlegm were not significantly different in the four seasons.*

Chest Illness

In response to the question, "During the past three years have you had a chest illness which kept you in bed or off work or indoors at home for at least a week?," 11 per cent of the men and 14 per cent of the women said "yes." The percentage of persons who had had one or more such illness is shown for age-specific groups in Table 2, and there was very little difference with age. There was, however, a consistently higher percentage of women affected, presumably because it was easier for them to stay in bed or indoors at home for as long as a week.

The prevalences of chest illness in persons with and without cough and phlegm are shown in Figure 2. It is interesting that the three classes in women are clearly demarcated with those having the most severe grade of cough and phlegm having the highest proportion with one or more chest illness, and those free from these symptoms having the lowest. The differences in these proportions are significant at the 1 per cent level in each of the first three age groups and at the 5 per cent level in

* The data may be obtained upon writing to the authors.

Table 1—The Prevalence of Cough and Phlegm by Age and Sex, Tecumseh, 1959-1960

Respiratory Symptoms	Percentages													
	Men Age					Women Age								
	16-19	20-29	30-39	40-49	50-59	60-69	70-79	16-19	20-29	30-39	40-49	50-59	60-69	70-79
Cough and phlegm														
Grade I*	16	33	39	41	37	40	35	8	22	24	23	20	21	25
Grade II†	1	4	8	10	11	13	11	2	2	4	7	3	3	3
Total	17	37	47	51	48	53	46	10	24	28	30	23	24	28
Number examined	211	448	671	460	323	170	100	237	576	698	467	319	195	115

* Grade I—Cough alone or phlegm alone or both less than Grade II.

† Grade II—Cough and phlegm—one or both present throughout the day for three months in the year.

Table 2—The Percentage of Persons Reporting Chest Illness in the Three Years Preceding Interview, by Age and Sex, Tecumseh, 1959-1960

Number of Illnesses	Men Age										Women Age				
	16-19	20-29	30-39	40-49	50-59	60-69	70-79	16-19	20-29	30-39	40-49	50-59	60-69	70-79	
One	6	7	7	8	10	8	12	11	10	12	8	10	14	10	
More than one	2	3	3	3	2	4	0	3	3	4	4	4	6	4	
Number examined	209	447	670	457	320	169	100	235	576	694	465	314	191	114	

women aged 50-59 years. In men there is a significant difference in only one decade—the fifth. The sex difference shown here raises the question, “Does the presence of cough and phlegm in women mean something different from what it means in men?” More specifically, “Are women with these symptoms suffering from more serious chest disease and, therefore, more prone to develop a superimposed chest illness?” This point will be considered in the discussion.

Shortness of Breath

All adults were asked, “Are you ever troubled with shortness of breath?” Those who said “no” were then asked whether they were affected when they climbed stairs, walked at a moderate pace, ate a meal, were excited or angry, or were lying down. Physicians reviewed all positive answers, asked additional questions about the occurrence and severity of the condition, and if appropriate diagnosed orthopnea, undue exertional dyspnea, paroxysmal nocturnal dyspnea, or dyspnea due to pulmonary insufficiency. The reporting of shortness of breath in response to the

standard questions depended on the subject’s awareness of the condition, interpretation of its significance, and willingness to admit to it. Some people reported shortness of breath with extreme exertion or transient emotional upset, and physicians considered the condition “not significant” in 11 per cent of the men and 12 per cent of the women; for the purpose of this report these people have been grouped with those who denied the symptom. In order to reduce observer variation, it would have been better to ask everyone whether shortness of breath occurred with specified activities, to have separated the different types of dyspnea, and to have graded their severity by means of standard questions; unfortunately, this was not done during the first round of examinations. The age, sex-specific prevalence rates of shortness of breath are given in Table 3, where it can be seen that in both sexes the symptom increased in frequency with increasing age. In every decade except the seventh there was a higher rate in women; however, nearly all the differences between the sexes in the reporting of shortness of breath oc-

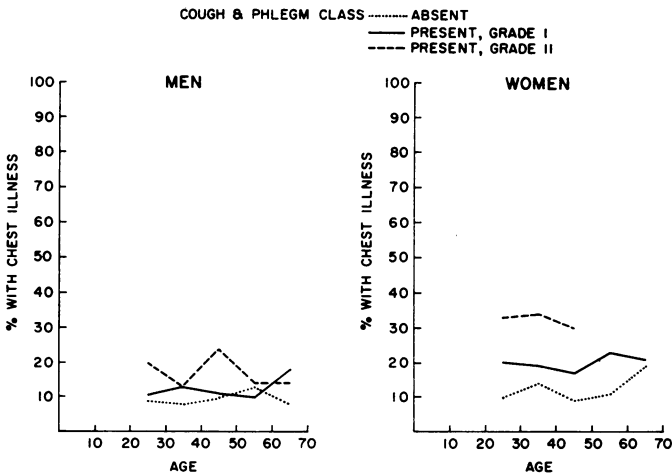


Figure 2—The Percentage of Persons Reporting Chest Illness in the Three Years Preceding Interview by Cough and Phlegm Class, Tecumseh, 1959-1960

Table 3—The Percentage of Persons Reporting Shortness of Breath* by Age and Sex, Tecumseh—1959-1960

	Men Age							Women Age						
	16-19	20-29	30-39	40-49	50-59	60-69	70-79	16-19	20-29	30-39	40-49	50-59	60-69	70-79
Shortness of breath	8	11	18	23	32	47	41	16	22	28	35	36	40	46
Number examined	205	442	660	449	320	167	98	235	571	692	462	318	191	111

* See text for definition.

Table 4—Mean Values of Forced Expiratory Volume(1.0) by Age and Sex, Tecumseh, 1959-1960

	Men Age							Women Age						
	16-19	20-29	30-39	40-49	50-59	60-69	70-79	16-19	20-29	30-39	40-49	50-59	60-69	70-79
Mean F.E.V. _{1.0}	3.8	3.7	3.5	3.0	2.6	2.2	2.0	2.7	2.6	2.5	2.2	2.0	1.7	1.5
Number examined	139	302	421	311	202	110	53	141	379	453	297	180	126	67

Table 5—Smoking Habits by Age and Sex, Tecumseh, 1959-1960

	Percentages													
	Men Age							Women Age						
Smoking Class	16-19	20-29	30-39	40-49	50-59	60-69	70-79	16-19	20-29	30-39	40-49	50-59	60-69	70-79
Nonsmokers	44	17	9	11	10	19	19	66	48	44	46	70	80	83
Ex-smokers	16	11	12	13	16	23	24	12	15	10	13	7	8	8
Cigarette smokers	38	63	69	65	60	42	33	22	38	46	41	23	12	9
Pipe and cigar smokers	3	10	11	10	14	16	23	—	—	—	—	—	—	—
Number examined	199	442	665	454	317	169	99	236	576	698	467	319	195	115

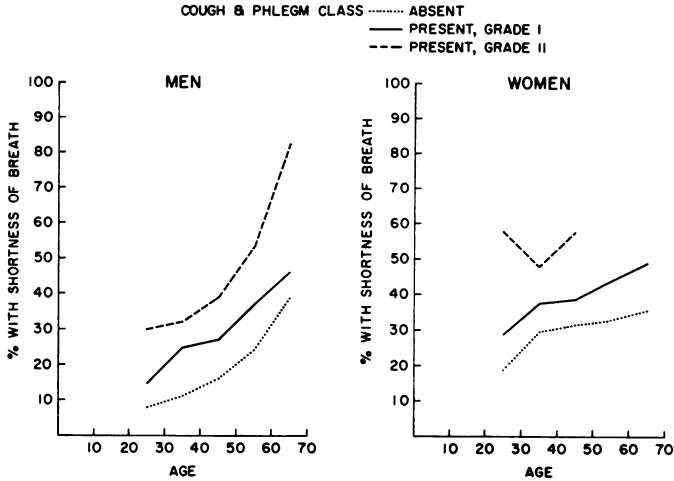


Figure 3—The Percentage of Persons Reporting Shortness of Breath by Cough and Phlegm Class, Tecumseh, 1959-1960

curred below the age of 50, when women were affected more often than men to a highly significant degree.

In Figure 3 it can be seen that in men and in women shortness of breath was reported more often by those with Grade II cough and phlegm, and with decreasing frequency by those with Grade I cough and phlegm and neither cough nor phlegm. The differences in the proportions are significant at the 1 per cent level in all age groups in men and in the first three in women. In each category the percentage affected increased with age, and with the exception of those aged 60-69 the percentage affected was always higher in women.

Chest Illness and Shortness of Breath

An association between the occurrence of chest illness in the three years preceding the interview and the reporting of shortness of breath was apparent. Of those men who had had no such chest illness 20 per cent said they were troubled with shortness of breath, whereas 34 per cent of men with one or more chest illness reported shortness of breath. In women the comparable fig-

ures were 28 per cent and 39 per cent. The differences in the proportions were significant in only two age-specific groups, these being the 30-39 and 40-49 year old men and women.*

Lung Function

A simple test of ventilatory function was included in the clinic procedures, a Collins timed vitalometer being used to record vital capacity and forced expiratory volume—(F.E.V._{1.0}). The latter is the volume of air expired in the first second following a maximal inspiration and it is an indicator of airway obstructive disease. Only the F.E.V._{1.0} (corrected to body temperature)¹³ is presented here, and because of a change in technic during the course of the study, only 64 per cent of the population was included in analyses involving F.E.V._{1.0}. The sequence of examinations was sample by sample, as previously described, and, therefore, this incompleteness should not introduce any appreciable bias. The values of F.E.V._{1.0} given in Table 4 are based on the mean of three readings

* The data may be obtained upon writing to the authors.

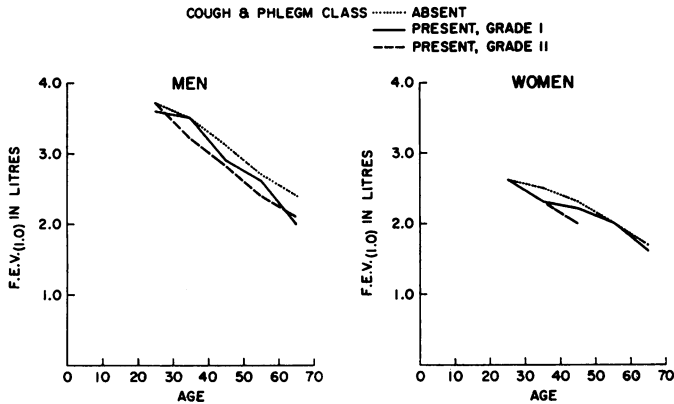


Figure 4—Mean Values of Forced Expiratory Volume (1.0) by Cough and Phlegm Class, Tecumseh, 1959-1960

taken after two trial attempts. In men and in women the values decreased strikingly with advancing years. At all ages the values were lower in women, but this was to be expected for the measurement is related to body size.

Mean values of F.E.V._{1.0} in persons with and without cough and phlegm are compared in Figure 4. The variability of the measurement within groups did not change appreciably with age in either sex, although it was consistently lower in women; the standard deviations were approximately 0.7 in men and 0.5 in women. There was little difference in the mean values of F.E.V._{1.0} between the groups although the values in those without cough and phlegm were consistently higher. Among the men, those with Grade II cough and phlegm had values which were in general lower than in those with Grade I; this pattern was also apparent among women aged 30-49 years. When the age-adjusted means of the three groups were compared by analysis of covariance the differences were highly significant. The values adjusted to the over-all mean age of 40 years were for men 3.24 liters in the absence of cough and phlegm, 3.11 liters in the presence of Grade I symptoms, and 2.98 in the presence of

Grade II symptoms; for women the corresponding values were 2.35, 2.30, and 2.16 liters.

The relationship between subjective shortness of breath and F.E.V._{1.0} is shown in Figure 5. The symptom may, of course, develop in conjunction with disease other than lung disease, but nevertheless the presence of shortness of breath was associated with lower mean values of F.E.V._{1.0} in both sexes at all ages. Mean values of F.E.V._{1.0} adjusted to the over-all mean age were 3.24 liters in men without shortness of breath and 2.94 liters in men with shortness of breath; in women they were 2.37 and 2.25 liters, respectively. These differences are significant at the 1 per cent level.

Smoking Habits

Information was sought about past and present smoking habits in adults in Tecumseh. Men were asked about their use of cigarettes, cigars, and pipes and women about cigarettes only; those who had ever smoked were asked how much tobacco they used and for how long they had been smoking.

Four groups of men and three groups of women have been designated on the

basis of smoking habits at the time of interview. The numbers in each decade from the third to the eighth are shown in Figure 6. Nonsmokers were persons who had never smoked at all, and in this category there were 364 men and 1,468 women aged 16 and over. Ex-smokers were divided about equally between the sexes, but a larger proportion of the women were under 50 years of age. Altogether 335 men said they had stopped smoking as did 291 women.

Cigarette smokers have been subdivided into those using less than a pack, a pack, and more than a pack of cigarettes a day at the time of interview. Men who also smoked pipes and cigars have been included with cigarette smokers. The distribution into light, moderate, and heavy categories was about equal in the 1,400 men, but very few of the 888 women said they smoked more than 20 cigarettes daily, and light smokers were about twice as common as moderate ones. Present age was not related to daily consumption of cigarettes except at both extremes of the range where the proportion of light smokers was largest. Of the men, 260 smoked pipes and cigars only.

The excess of young people is noticeable in all classes and is, of course, a

reflection of the age distribution of the study population. Smokers were also divided into three groups according to the length of time they had been smoking, the divisions being at 10 and 20 years. The duration of smoking was highly correlated with present age and attempts at assessing its effect on the development of symptoms have been seriously limited by this fact. The finding is in keeping with other reports that the majority of smokers acquire the habit early in adult life.^{11,12}

The percentage distribution in age, sex-specific groups is shown in Table 5; 15 per cent of the men aged 16 or over had never smoked and the percentage was highest in the very young and the old. Of the women, 55 per cent were nonsmokers, and a marked division is seen at 50 years with the percentage of nonsmokers being much higher above this age.

In men the proportion of ex-smokers increased with age, but in women it was slightly lower in the three oldest age groups.

As expected, cigarette smoking was much more common in men than women, and this was especially true at older ages; in all, 59 per cent of men smoked cigarettes as did 34 per cent of women.

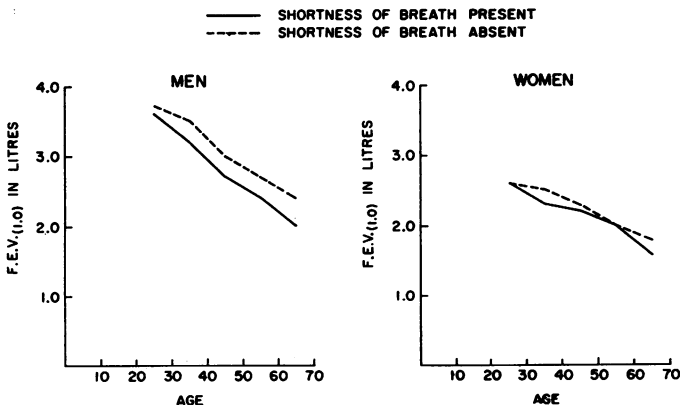


Figure 5—Mean Values of Forced Expiratory Volume_(1.0) by Shortness of Breath, Tecumseh, 1959-1960

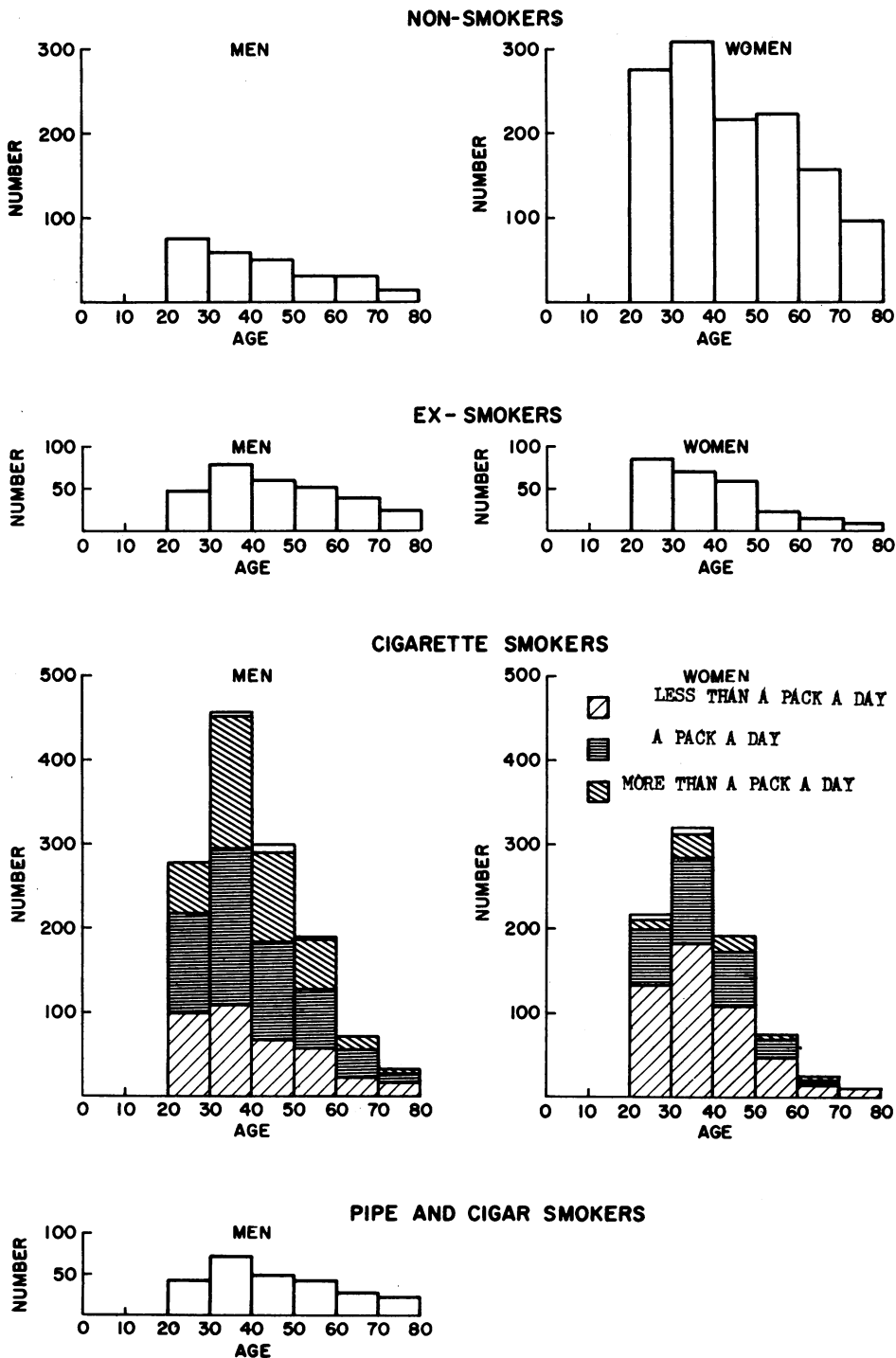


Figure 6—Smoking Habits, Tecumseh, 1959-1960

The proportion of men who smoked pipes and cigars did not vary much with age but was largest at older ages.

Respiratory Symptoms and Smoking Habits

The prevalence of cough and phlegm by age, sex, and smoking class is shown in Figure 7. The solid lines show the rates in cigarette smokers who reported more cough and phlegm than did any of the other groups. This was true for Grade I and Grade II symptoms and for both sexes and all ages, with the exception of women over 50. The differences are significant at the 1 per cent level.

In comparison with nonsmokers, cigarette smokers had a relatively higher prevalence of Grade II than Grade I symptoms; the prevalence of Grade II symptoms in men who smoked cigarettes

was six times that in nonsmoking men, whereas the prevalence of Grade I symptoms was only twice as large. Among women, cigarette smokers had three times as much Grade II cough and phlegm and twice as much Grade I as nonsmokers.

Neither ex-smokers nor pipe and cigar smokers differed appreciably from the nonsmokers except in the oldest age group where the proportion with Grade II symptoms was less in nonsmokers. It is interesting to note that in nonsmokers in this population there was no significant difference between the sexes in the prevalence of cough and phlegm.

To return to cigarette smokers, similarity in the prevalence of Grade II symptoms in men and women may be noted in the three youngest age groups,

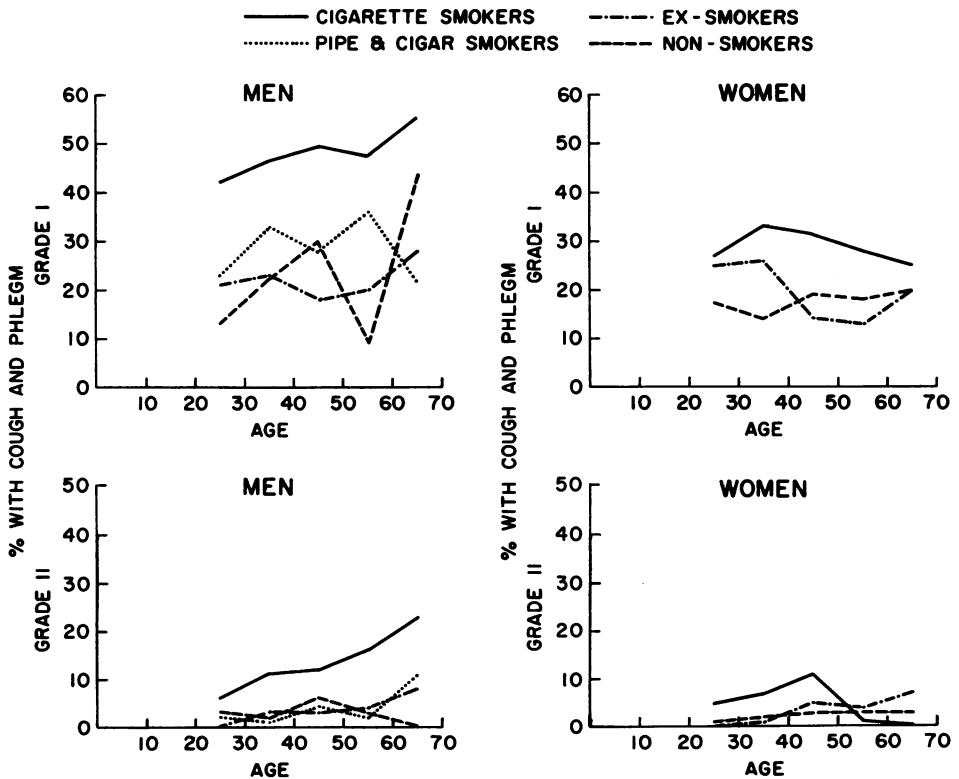


Figure 7—The Prevalence of Cough and Phlegm by Smoking Class, Tecumseh, 1959-1960

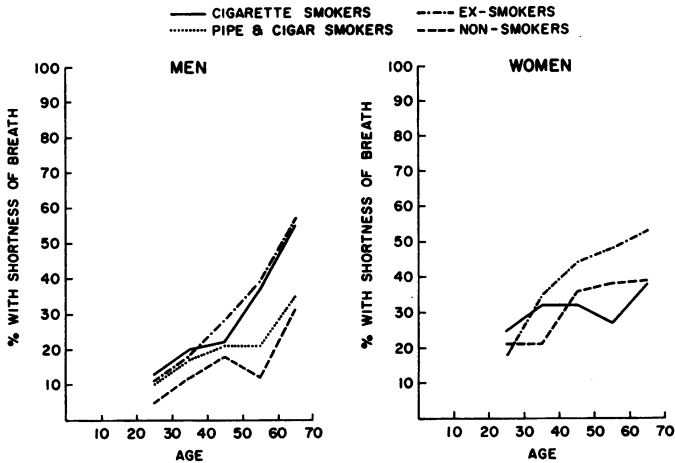


Figure 8—The Percentage of Persons Reporting Shortness of Breath by Smoking Class, Tecumseh, 1959-1960

but there was a striking difference between the sexes in the percentages reporting Grade I symptoms. The prevalence of symptoms increased with age in men who smoked cigarettes, and this was more marked for Grade II cough and phlegm than for Grade I. If this were an effect of age itself or of some experience associated with aging, one would expect to find a similar trend in nonsmokers. Considering Grade II symptoms one sees no such trend and may, therefore, postulate a relationship between the duration of smoking and the development of Grade II cough and phlegm, for present age was related to the length of time cigarette smokers had been using tobacco, whereas there was no increase in the proportion of moderate and heavy smokers with age (Figure 6).

On subdividing cigarette smokers into light, moderate, and heavy classes on the basis of their daily consumption of cigarettes, it was found that, in general, the prevalence of cough and phlegm was highest in those smoking most and lowest in light smokers.* There were too

*Data may be obtained upon writing to the authors.

few women who smoked heavily for them to be included in this or other comparisons. The prevalence of Grade II symptoms was similar in men and women who smoked 20 cigarettes a day, and this also held for Grade I symptoms in persons 20-49 years of age. The prevalence of cough and phlegm was, however, less in women who were light smokers than it was in men who were light smokers. Even when the groups were subdivided into those smoking less than 10 cigarettes a day and those smoking 10-19 daily, the sex difference remained. Thus while the over-all difference between the sexes in the prevalence of Grade I symptoms may be due in part to a sex difference in consumption of cigarettes at the time of interview, this cannot account for all the difference.

The relationship between smoking habits and shortness of breath is presented in Figure 8. Among the men, cigarette smokers and ex-smokers were affected about equally and more often at all ages, but relative to nonsmokers and pipe and cigar smokers, they were much more frequently affected at older ages. This finding suggests that smok-

ing for prolonged periods of time may be related to the development of shortness of breath and that this is added to the effect of aging itself or of experiences associated with aging. Among the women it was the ex-smokers who reported shortness of breath most commonly, with the cigarette smokers having more shortness of breath than the nonsmokers below the age of 40, and less above this age.

The relationship between present daily consumption of cigarettes and shortness of breath was that in general the percentage affected was largest in those smoking most cigarettes and least in those smoking fewest.*

Since it has already been shown that, in comparison with the rest of the population, more cigarette smokers had cough and phlegm and that more persons with cough and phlegm had shortness of breath, it was to be expected that more cigarette smokers would also have shortness of breath. A comparison of the prevalence of shortness of breath by smoking class has been made in persons

who had neither cough nor phlegm. The results are shown in Figure 9; ex-smokers of both sexes again reported more shortness of breath than did any of the others, and among the older men cigarette smokers were more often affected than nonsmokers. Comparing cigarette smokers without cough and phlegm with all cigarette smokers (Figures 8 and 9), it is apparent that the excessive reporting of shortness of breath by the younger members of the group occurred in those who also had cough and phlegm. The favorable position of older women cigarette smokers is apparent once again.

Ventilatory Function and Smoking Habits

The mean values of forced expiratory volume by smoking class are shown in Figure 10. Among the men, cigarette smokers had the lowest values at all ages and nonsmokers the highest, except in the youngest age group. Pipe and cigar smokers occupied an intermediate position and young ex-smokers had high values, whereas ex-smokers over 50 had lower values. The mean values of F.E.V._{1.0} in women varied hardly at all between the various categories.

* The data may be obtained upon writing to the authors.

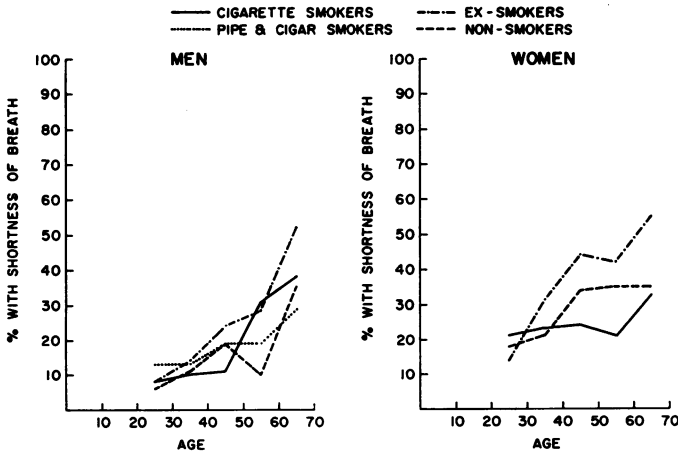


Figure 9—The Percentage of Persons Reporting Shortness of Breath by Smoking Class, Persons Reporting Neither Cough nor Phlegm, Tecumseh, 1959-1960

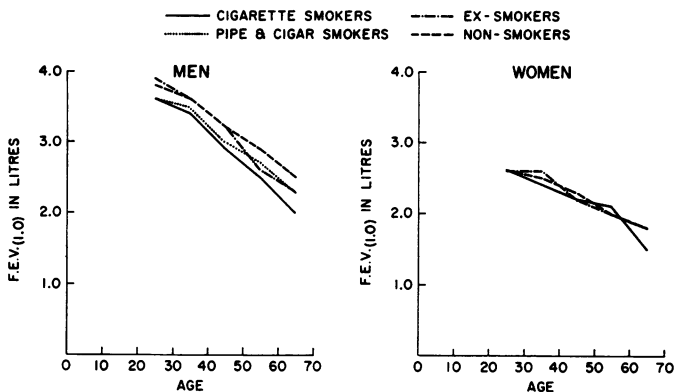


Figure 10—Mean Values of Forced Expiratory Volume(1.0) by Smoking Class, Tecumseh, 1959-1960

In men the mean F.E.V._{1.0} adjusted to the over-all mean age was 3.35 liters in nonsmokers and 3.12 liters in cigarette smokers; the corresponding values in women were 2.35 and 2.28 liters. The standard deviations were again approximately 0.7 in men and 0.5 in women. The differences in the means are significant at the 1 per cent level in men and at the 5 per cent level in women.

Mean values of F.E.V._{1.0} have been computed for cigarette smokers who smoked less than a pack, a pack, and more than a pack of cigarettes a day. Though the values differed only slightly they were consistently lower in those who smoked most.*

Discussion

In the course of analyzing these data some questions have been answered, others have been raised. Perhaps the most surprising finding was the frequency with which respiratory symptoms were reported; as many as a third of the adults reported cough or phlegm and a quarter said they were troubled with shortness of breath. The sex dif-

ference in the reporting of symptoms was striking and invites comment and explanation. Two important questions suggest themselves—first, what factors contribute to the development of respiratory symptoms, and, second, what is the significance of the symptoms? It is not possible to explore either exhaustively, and no attempt will be made to relate the various symptoms to specific diseases at this time.

Of the several factors known or thought to be associated with respiratory symptoms, smoking is the one most suitable for study in the Tecumseh population at the present time. An association between the use of tobacco and the development of cough and phlegm has been demonstrated in men and in women under 50, the prevalence of symptoms in cigarette smokers being higher than in other groups to a highly significant degree. A relationship between the reporting of shortness of breath and the use of tobacco has also been shown, in this case cigarette smokers and ex-smokers being affected more often than nonsmokers or pipe and cigar smokers. In both cases support for the role of cigarette smoking is provided by the finding of a gradient from light to moderate to heavy smokers with those using most cigarettes being more often

* The data may be obtained upon writing to the authors.

affected. It has not been possible to assess the relationship between duration of smoking and the development of cough and phlegm or shortness of breath, but the increasing prevalence of symptoms with increasing age in male cigarette smokers suggests that there may be an effect other than age itself, for no trend or a less marked trend is seen in nonsmokers.

The absence of a sex difference in the prevalence of cough and phlegm in nonsmokers and in smokers using 20 cigarettes a day also strengthens the suggestion that cigarette smoking is an important factor, for if industrial exposure were related, one would expect higher rates in men. Although detailed information on the level of air pollution in Tecumseh is not yet available, it is known to be low.

There are still some unexplained differences in the relationship between cigarette smoking and respiratory symptoms; these include the higher prevalence of cough and phlegm in men than women who smoked less than 20 cigarettes a day, and the low prevalence of cough and phlegm and shortness of breath in older women who smoked cigarettes.

Reasons for giving up smoking have not been determined, and among the ex-smokers are some who discontinued the habit early in life after a short period of use and some who gave up after many years; it is to be expected that some of the latter stopped smoking because their health was impaired. Similarly, some of the men who were light smokers or pipe and cigar smokers at the time of interview may have changed their smoking habits because of impaired health. During the course of this study an attempt will be made to look further into this and into the effect of stopping smoking; at present it appears that ex-smokers have no more cough and phlegm than nonsmokers but that more of them are short of breath.

Let us return to the second question, "What is the significance of the various respiratory symptoms?" There are several important facets to this question—it might be answered in terms of mortality, morbidity, or impairment of function, or in terms of diseases or groups of symptoms. So far attention has been confined to relationships between symptoms and their effect on a simple test of ventilatory function. It has been shown that persons with cough and phlegm were more commonly afflicted with chest illness and with shortness of breath. In every case a larger proportion of persons with Grade II than Grade I cough and phlegm reported a second symptom. It was suggested that cough and phlegm might be of different significance in women, but apart from the difference in reporting of chest illness, there was no evidence for this either in the reporting of symptoms or in impairment of lung function as measured by the F.E.V._{1.0}. The explanation for women reporting shortness of breath more often than men has not been presented and in both sexes it will be interesting to relate shortness of breath to weight as well as to specific diseases. An association has been demonstrated between the occurrence of chest illness in the three years preceding interview and the reporting of shortness of breath, but the nature of this association cannot be determined from the data available at this time.

Mean values of F.E.V._{1.0} were significantly lower in persons with cough and phlegm and shortness of breath, but the absolute differences were small. In men with Grade I and Grade II cough and phlegm they equaled, respectively, 4 per cent and 8 per cent of the value in asymptomatic men; in women the corresponding reductions equaled 2 per cent and 8 per cent of the value in asymptomatic women. The reductions in forced expiratory volume in conjunction with shortness of breath were 9 per cent and 5 per cent of the values in non-

affected men and women, respectively. In order to assess the statistical significance of differences in F.E.V._{1.0} in members of different groups it is convenient and appropriate to compare mean values; however, in order to assess impairment of ventilatory function which is of physiological significance a comparison of the proportions with low values would be more telling. Frequency distributions of F.E.V._{1.0} in age, sex-specific groups were essentially the same in those with and without cough and phlegm and shortness of breath, but they were shifted slightly to the left in those with symptoms; the shift was greater in men than women.*

Because of the considerable interest in the effect of smoking, a brief summary of the findings in cigarette smokers would seem appropriate.

While more cigarette smokers suffered from cough and phlegm and shortness of breath than did nonsmokers or pipe and cigar smokers, nevertheless a substantial proportion of them were free from symptoms. In fact, 44 per cent of these men had neither cough nor phlegm and 87 per cent were not troubled by shortness of breath; in each case the percentage decreased with age. In women cigarette smokers the percentages without cough and phlegm and without shortness of breath were 84 and 78, respectively. In comparison with nonsmokers, men who smoked cigarettes had, on the average, values of F.E.V._{1.0} decreased by 0.2 liters at the over-all mean age of 40 years; in women who smoked cigarettes the comparable reduction was 0.1 liter. These differences are small and amount to 7 per cent and 3 per cent of the values in nonsmoking men and women, respectively. Comparison of the frequency distribution of values of F.E.V._{1.0} in the two groups showed that of cigarette smokers to be slightly to the left of that of nonsmokers with

the shift being greater in men and at older ages.† The relationship between respiratory symptoms, ventilatory function and smoking habits is, of course, only one aspect of the complex relationship between smoking habits and health and disease; many constitutional and environmental factors must be identified and evaluated before it can be assessed adequately. Observations must be extended over the years and the prevalence and incidence of disease measured, and morbidity and mortality compared.

The first phase of a longitudinal study yields the same information as a cross-sectional survey and this is of intrinsic value as well as a baseline for further observations. In Tecumseh the distributions of a number of variables have been ascertained as have the prevalences of a variety of symptoms and diseases. Associations are being sought between these symptoms and diseases and a number of constitutional and environmental factors. There is great interest in establishing whether these characteristics aggregate in families or kindred groups. Much of this information was not previously available for a total population; however, segments of other populations have been studied and though they were usually selected by age and sex and sometimes also by occupation, comparisons may be made with the appropriate subgroups from Tecumseh. Such comparisons will disclose regional and international similarities and differences. It is to be hoped that they will help to assess the importance of features like climate and air pollution and suggest other factors of possible significance in the development and progress of chronic respiratory disease.

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Even the "Anti's" Have Somebody for Them

A physicist in Birmingham, England, has come up with a "do it yourself" method to defluoridate water. It is not that he is against fluoridation, you understand, he is just sorry for the mental anguish suffered by the Anti's as they face their fluoridated water.

The prescription as outlined in "This Week in Public Health" (December 2, 1963), the publication of the Massachusetts Department of Public Health, is as follows:

"Two pounds of bone meal should be sifted vigorously in a gravy strainer to remove the dust, he says, then the meal should be charred by placing it in a cocoa tin and burying it in a fire. The cocoa tin should be tight enough to keep out the ash but not so tight that hot gases cannot escape. A jam jar should then be three-quarters filled with the meal and a funnel inserted deep into it. Water is allowed to drip into the funnel so that it seeps up through the bone meal and spills over the rim of the jar into a basin. This will provide a family of four with defluoridated water for at least four months before fresh bone meal is needed."