CHRONIC BRONCHITIS

by

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INTRODUCTION

Among those cases referred to the chest physician for opinion, the commonest presenting symptom is persistent production of phlegm. There are often no radiological signs of disease, the condition being simple bronchial catarrh, but there may be varying degrees of respiratory disability. Objective determinations of disability could readily be recorded with the availability of the Wright Peak Flowmeter, providing as it does a simple portable means of assessing ventilatory capacity. A number of epidemiological studies based on population surveys had been reported, when the work of Fletcher, Elmes, Fairbairn and Wood (1959) using a questionary on symptoms with Post Office workers provided a further stimulus. It seemed that criteria for the diagnosis of chronic bronchitis were at last stated which could form the basis of a clinical study.

It was decided to use the method of one hour morning sputum collection to verify the answers to the diagnostic questionnaire on phlegm production. Having excluded other conditions by a full clinical and radiological check, an established series of confirmed bronchitics would be available for anthropometric and X-ray film measurements with an estimate of respiratory function by Peak Flowmeter. Farther the social background especially in regard to housing, working conditions and smoking history, would be recorded and could be used in an assessment by statistical analysis.

Cases of chronic bronchitis were to be studied at one point in time, the intention being to use the material in a statistical survey which though retrospective would be complementary to the epidemiological approach and this report forms the subject of the following thesis.

SUMMARY OF FINDINGS

In the present survey the criterion for inclusion is admission of morning sputum for three months of the year for two years. The variation in each attribute has been analysed with reference to age and disability gradings. Valid comparisons are possible without the use of formal controls since the mildest disability group comprises individuals having little or no ventilatory disturbance, while the severest disability group includes many with gross defect.

Of the physical variables, height and weight diminish on the whole with increasing disability. For women unlike men, age has a strong association with increase in body weight. Within the grossly disabled group of men, emphysema is linked with further weight loss. Both systolic and diastolic blood pressures rise with disability in women, but a parallel rise occurs only in the youngest men for the diastolic blood pressure. Increases with age are confirmed for both sexes. The maximum chest girth does not vary with disability in either sex, although a decrease occurs with emphysema for men within the greatest disability group. An increase with age occurs for women alone. Chest girth measured at the diaphragm, shows a decrease in severe disability for men only, with significance in the oldest age group alone. A decrease of chest expansion with disability is observed at both levels for each sex, with certain exceptions. For example, at diaphragm level there are low averages in least disability among the oldest men. Diminished expansion with age is most obvious in women.

Among X-ray measurements, hemithoracic vertical height increases with disability in women. In men the increase is not consistent, the shortest diameter on each side occurring in intermediate disability and a further increase occurs with emphysema among the severest disability group. Age trends are not consistent. Diaphragm height decreases with disability for each sex and tends to diminish with age. An exception is the lack of variation between least and intermediate disability in men. A further reduction occurs with emphysema among men of greatest disability in the oldest ages. The respiratory range in vertical chest diameter diminishes with disability for each sex, the effect of age being inconstant. A significant diminution occurs with emphysema in the greatest disability group for men. Transverse chest diameter shows no recognisable trend with disability and a reduction with emphysema in severest disability for men, is not significant The age diminution is irregular, being only seen in least disability for men and greatest disability for women. Chest depth shows inconstant increase with disability for each sex. No significant alteration occurs with emphysema in the greatest disability group for men. Age increases are of small magnitude. Kyphotic angle increases with disability and with age for each sex, in this series. The costo-vertical angle, which is a measure of the slope of the ribs, shows no consistent variation with disability except a reduction in severe disability for both sexes. A reduction with emphysema occurs among men of severest disability. For women only, an increase occurs in older age giving more horizontal ribs.

Increase of distance between ribs occurs with disability for each sex, significant only in the intermediate age group for men. No increase with emphysema among men of greatest disability is found nor is there variation with age. Transverse heart diameter tends to increase with disability but there is a diminution in severest disability and a further diminution with emphysema among men of greatest disability. An age increase is confirmed. Heart depth tends to increase with disability for women and the trend for men is similar to the transverse heart diameter, namely an increase between slight and intermediate disability and a diminution in severe disability with a further decrease with emphysema among men of greatest disability.

The X-ray measurements for women average smaller values generally than for men and the range is frequently less. The exception is in the case of the kyphotic angle, women being more kyphotic than men by four degrees on average and the range is greater by that amount.

The influence on Peak Flow Rate of the independent variables age, respiratory difference in vertical chest diameter, body weight, and kyphotic angle are assessed by partial and multiple correlation. For men the most important variables are age and respiratory difference in vertical chest diameter, while for women they are age, body weight, and respiratory difference in vertical chest diameter. Prediction equations are presented.

Diagnostic Criteria. In the present series, a significant association exists between previous recognition of the bronchitic state and disability for each sex.

Phlegm in the morning in winter is significantly associated with disability for men only, and sputum by day in winter shows such significance only among older men. In neither sex is there a significant relation between a three months history each year and degree of disability. The importance of a two years total duration cannot be assessed owing to insufficient numbers outside this criterion. For both sexes breathlessness is significantly associated with disability; wheeziness is significantly related to disability only for men. Loss of working time annually by reason of bronchial illness bears no relation to disability for either sex in this series. Recurring chestiness short of resorting to bed, also shows no association with disability.

Social Study

Father's social class is significantly related to disability for men only, when distinguishing classes I and II from the others, but not when classes I II and III are contrasted with the remainder. Neither irregularity of father's employment nor a working mother shows any association with disability. Loss of schooling from illness is also unrelated to disability for either sex. On the other hand, lesser educational attainmentsis significantly associated with disability for both sexes and there is an inverse relation for all women and older men between delay in starting work after 15 years and disability. No association is traced between patient's own social grading and disability for either sex although for women there is a significant age association.

Occupational "wanderers" of neither sex show any tendency to disability, but an inverse relation exists between work insecurity and age at least among the most disabled men. Regular travel in smoking compartments bears no relation to disability. Breadth of outside interests is unrelated to the degree of disability in each sex.

Later marriage is associated with disability but only among younger men. Again in younger people only, there is an association between the married state itself and disability which is direct for men and inverse for women. No association exists for either sex between the number of individuals in the household and disability. An inverse association has been traced between the number of rooms inhabited and disability for men only. In neither sex does an association exist between insanitary housing (damp or unsound buildings) and disabilit The ratio of persons to rooms bears no relation to disability. Neither is overcrowding a significant factor. The number of changes of domicile shows no association with disability yet an age association is confirmed. Social hardship in childhood is associated with present disability only for men. Neither the seniority index in the family nor the number of sibs bears any relation to present disability or to age for either sex.

For the men in this series no association exists between the number of cigarettes consumed and disability whether the critical level is considered at 15 or 20 cigarettes a day and whether ex-smokers are included or excluded. No association exists between smoking itself and disability except in the contrast between present non-smokers (including ex-smokers) and smokers, the relation then being inverse.

For women no associations have been traced between smoking and disability. With certain qualifications, an inverse trend with age is evident for women. The age at start of smoking is not a significant factor for either sex. The number of years a smoker has no significance among younger members of each sex, but in older men a significant association exists with disability. Too few older women smoke to allow this relation to be tested among women.

No associations exist for alcohol except between age and drinking preferences. The duration of personal chest history is significant in relation to disability for each sex; no age associations exist. Neither a chest history in a previous generation nor in a sib bears any relation to present disability. Chest illness in infancy is immaterial and only in younger men does an association exist between personal childhood chest history and disability.

The state of nutrition is inversely related to disability for men. Among younger women only there is a positive relation between nutrition and disability. No relation is found between haemoglobin level and disability. For men significant associations exist between purulence of sputum, between volume of morning specimen (both including and excluding purulent cases) and disability. For women no such associatio can be traced but an age relationship is often apparent, inverse in the case of purulence.

Neither shoemaker's chest nor Harrison's sulcus is associated with disability for men. For women in the younger ages only, there is an inverse association between sulcus deformity and disability.

On the other hand kyphosis and intercostal retraction are both associated with disability for men. A significant association between age and kyphosis exists only in women of lesser disability.

Of seventeen physical signs suggesting emphysema, significant associations with disability exist for men in twelve namely short neck, prominent sternomastoid, inspiratory posture, resonance extending to costal margin, weak respiratory murmur, diminished vocal fremitus, diminished vocal resonance, prolonged expiration, absence of cardiac impulse, diminished cardiac dullness, weak cardiac sounds, and diminished liver dullness. There is a sex difference and for women disability associations exist in the case of short neck, prominent sternomastoid, prolonged expiration, diminished cardiac dullness, and diminished liver dullness; and in addition for young women only in barrelling of the chest, supraclavicular bulging, and inspiratory posture. Full jugular veins, and hyperresonance have no significant associations for either sex; and "emphysematous girdle" has only age associations for limited groups of men and women.

No significant associations with disability have been traced for either sex in the case of apical systolic murmurs, oedema, degree of radial artery thickness, deficient dorsalis pedis pulse, fundal changes, hernia or thyroid abnormalities. For men associations exist in bronchospasm, cyanosis, clubbing etc. of fingers, marginally in deficient posterior tibial pulse and in varicosities (for older men only and the relation is inverse).

SCOPE OF THE INVESTIGATION

The material for this study consists of 569 patients referred by their general practitioners to the Chest Clinics at Rutherglen and at Lightburn Hospital for X-ray and clinical assessment during the period between December 1959 and March 1962. This total is made up of 367 men and 202 women. As an indication of the true relative frequency for the two sexes, of the first 500 cases accepted without selection as to sex, 355 are men and only 145 are women. All ages from 17 years upwards have been included and as far as possible no omission made. It will be seen later that the distribution as to age and disability grades is not comparable for each sex.

In the course of normal clinical enquiry a preliminary decision has been made as to whether the diagnostic criteria for chronic bronchitis are fulfilled. A later appointment is then arranged to suit the patient's work commitments as far as possible and at the second visit a modified questionnaire has been completed and as full a clinical examination as the facilities of the clinic would allow, has been carried out.

A set of radiographs of the chest has been taken in each case comprising:-

1. Full inspiration postero-anterior
2. Full expiration postero-anterior
3. Inspiration right lateral.

A number of cases have had bronchograms performed but in a study of this magnitude it has obviously been out of place to subject all the patients to this procedure as a routine.

Only those with persistent sputum and likely radiographic appearances have been examined in this way, the aim being to exclude patients with distinct bronchiectasis unless the history, symptoms and signs otherwise indicate chronic bronchitis.

Where necessary a barium swallow has been performed to delineate the posterior heart border.

Certain social enquiries have been included in the questionnaire for later study the intention being to transfer a large proportion of the resulting data to cards for ease of manipulation and calculation. All the statistical analyses in this thesis have been computed by myself and in this work both the card system and the use of a Diehl electrical calculating machine have been invaluable.

GROUPING OF CASES

The grouping according to age has been varied to suit the numbers required at certain stages of the statistical study. On the other hand the same disability gradings have been employed throughout. A wide range of disability has been apparent from an early stage, sufficient it has been considered, to allow division of the cases into three grades:-

Group I	Those in whom there is least disability, presumably differing little from normal.
Group II	An intermediate group with only moderate disability.
Group III	Those with really severe disability.

The intention has been to establish a reliable system of disability grades based on objective criteria at least in part in order that a series of variables could be studied in relation to sex, age and disability without requiring comparison with normal controls. The following combination of clinical dyspnoea grades and peak flow rate estimations, has been used to determine allocation to the correction disability groups:

Disability Group I	Peak flow rate not less than 400 for men, or 350 for women.
	Admits dyspnoea not more severe than grade II
Disability Group III	Peak flow rate of 300 or less for men, or 250 or less for women.
Disability Group II	All others not included in Groups I or III.

PHYSICAL ATTRIBUTES

A number of physical attributes have been measured in each case in order to investigate the degree of change brought about by disability from chronic bronchitis and to estimate the relative importance of any divergences recorded. The variables measured are determined as follows:

Height and Weight

For men and women wearing a minimum of clothing and no footwear, readings are taken using a steelyard platform type machine giving accuracy to 3 oz. (90g.) with a height measuring attachment. Weight is taken to the nearest quarter pound (120g.) and height to the nearest quarter of an inch (0.6 cm.)

Systolic and Diastolic Blood Pressure

The mercury manometer apparatus with standard cuff is employed and by auscultation the reading is taken to the nearest even number. The systolic pressure is recorded at the point when sounds are first heard and the diastolic pressure at the point of sudden muffling which occurs prior to disappearance of the sounds. Blood pressure readings for each patient are taken several times and the last value is recorded. The patients are reclining, rested on the examination couch before any readings of blood pressure are taken.

Chest Girth "Maximum"

A cloth inch-tape is used to take the circumference of the chest for men at the level of nipples, or posteriorly at the lower angle of the scapula and for women at the level of lower angle of scapula horizontally. Readings are taken in full inspiration and full expiration, the recorded girth being the mean of these two values.

Chest Expansion "Maximum"

The recorded expansion is the difference between the two readings in full inspiration and full expiration.

Chest Girth "Diaphragm"

A similar series of readings has been recorded for the circumference of the chest where maximum diaphragmatic movement can be expected to show. The tape is arranged to lie around the lowest part of the ribs, with the anterior level about 2 inches below the xiphisternum.

Diaphragmatic Chest Expansion

The expansion at this level is obtained by subtraction as before.

MEASUREMENT OF CHEST X RAYS

These are assessed to the nearest millimetre on radiographs taken in postero-anterior or lateral positions at a distance of two metres with a current of 400 milliamps (300 milliamps for lateral), exposure being .06 second (or .15 second for lateral) the kilovoltage being altered to suit the thickness of chest. As far as possible the normal erect posture has been maintained by all subjects during these procedures. The cardiac borders are clearly defined in all cases. The following variables have been measured on each chest X ray film:

Inspiration P.A view:	Transverse Chest Diameter
	Transverse Heart Diameter
	Vertical Height of Left Hemithorax
	Vertical Height of Right Hemithorax
	Height of Left Diaphragm
	Height of Right Diaphragm
Expiration P.A view:	Vertical Height of Left Hemithorax
	Vertical Height of Right Hemithorax
	Height of Left Diaphragm
	Height of Right Diaphragm
Lateral view:	Chest Depth
	Heart Depth
	Kyphotic Angle
	Costovertical Angle
	Intercostal Distance

The transverse diameter of chest is measured horizontally at the widest point possible between the ribs at their internal borders superior to the costo-phrenic angles, and usually lies about the level of the domes of the diaphragm.

On each P.A film both inspiration and expiration, a vertical line is first drawn through the mid-point of the transverse diameter. This vertical serves as a guide when reading the vertical hemithoracic heights and the horizontal diameters. It should pass through the mid-points of the upper thoracic spines provided the chest is symmetrical.

The transverse heart diameter is the maximum horizontal width of the heart shadow. It is measured more easily using the set square on the mid vertical line and the rule horizontally, the whole combination being slipped downwards allowing the total distance to be read without any need for addition.

The vertical height of hemithorax is measured from the under surface of first or second rib whichever be the higher, to the uppermost point of the corresponding dome of the diaphragm. In a case of inverted diaphragm the dome may be the lowest point, the mid point of the curve being still used as the lower limit of this measurement. In the case of several overlapping curves the maximum sweep has been used to obtain a reading.

The height of diaphragm is the distance vertically measured from the top of the dome to the lowest point of the trough of the costophrenic angle. In the case of gross inversion it may be so reduced and the angle so opened out that the value may truly be considered negative in sign.

On lateral films, chest depth is the maximum distance horizontally between the inner surface of sternum and inner surface of posterior ribs. Heart depth is also taken horizontally at the widest point.

The kyphotic angle is measured between two intersecting lines, the upper running through the anterior borders of second and third thoracic vertebral bodies, the lower correspondingly through the anterior borders of eleventh and twelfth thoracic bodies.

The costo-vertical angle is measured between the vertical border of the film and the average inclination of the seventh rib on the lateral radiograph.

The intercostal distance is a measure of rib spacing from upper border of a rib to the upper border of the next. In order to form a truer estimate an average is taken of three such spaces measured from the fifth to the eighth upper borders, just anteriorly to the lung root at right angles to the main slope of the seventh rib.

The variables presented in this section are considered with reference to three age groups and three grades of disability. The three age groups are - under 40 years, 40 to 59 years, and 60 years and more.

The three grades of disability are as follows:-

I - Those with dyspnoea grade not more than II and P.F.R. not less than 400 l/ min. (350 litres per min. in women)

III - Those with dyspnoea grade not less than III and P.F.R. not more than 300 litres per minute. (250 litres per min. in women).

II - All others not included in I or III.

RESULTS

HEIGHT

Table I shows the means, standard deviations and coefficients of variation of height by sex, age and disability. Within each of the three age groups under consideration men and women present average heights for disability groups II and III which are less than the corresponding mean height for disability group I. Except in the youngest and intermediate age groups where women in disability group III are less tall than the women in disability group II, the height means of disability groups II and III are comparable.

Table IIa. contrasts for men the mean height of disability group I with that of the combined disability groups II and III by age groups. Although a level of statistical significance is not attained for the mean differences in the youngest and oldest age groups, nevertheless the signs are all negative with the mean difference in the intermediate age group being highly significant. ($P < 0.01$)

Table IIb. compares for women the mean heights of all combinations of pairs with respect to disability groups I, II and III by age groups. The mean differences are all negative in sign except those in the oldest age group where the mean difference between disability groups II and III is positive. The mean differences are significant in the youngest age group for disability groups I and III ($P < 0.05$), and in the intermediate age group for disability groups I and III ($P < 0.01$) and disability groups II and III ($P < 0.02$).

The consistent negative trend in mean differences for women is not the result of chance occurrence.

When the three disability groups are contrasted irrespective of age, (Table II c.) it is noted that while a mean difference between disability groups I and II just falls short of significance, the mean differences between disability groups I and III, and groups II and III are highly significant. ($P < 0.01$).

An assessment of height means of each disability group in terms of age indicates that there is no consistent variation with age for men, though there might be diminution with age. For women the mean heights show no consistent trend with age.

The absolute and relative variabilities change little by age or disability and are comparable for the sexes. The relative variability is exceedingly moderate.

TABLE I HEIGHT

The Means, Standard Deviations and Coefficients of Variation by sex, age and three grades of disability.

	Age group	Disability group	No.	MEANS ± S.E. (Inches)	S.D	C.V
MEN	Under	I	30	68.2 ± 0.433	2.4	3.5
	40 years	II	9	66.1 ± 1.235	3.7	5.6
		III	9	67.8 ± 0.542	1.6	2.4
	40 - 59	I	38	67.6 ± 0.473	2.9	4.3
	years	II	62	66.1 ± 0.335	2.6	4.0
		III	89	66.1 ± 0.249	2.3	3.6
	60 years	I	10	67.1 ± 0.969	3.1	4.6
	and over	II	35	66.0 ± 0.234	1.4	2.1
		III	82	66.4 ± 0.309	2.8	4.2
WOMEN	Under	I	24	63.0 ± 0.490	2.4	3.8
	40 years	II	39	62.6 ± 0.370	2.3	3.7
		III	14	61.4 ± 0.605	2.3	3.7
	40 - 59	I	11	63.5 ± 0.602	2.0	3.1
	years	II	37	62.7 ± 0.381	2.3	3.7
		III	37	61.5 ± 0.346	2.1	3.4
	60 years	I	2	64.5		
	and over	II	14	60.9 ± 0.635	2.4	3.9
		III	24	61.1 ± 0.657	3.2	5.3

TABLE II a. HEIGHT

The Means, Mean Differences, t Values and Probabilities for men, between disability groups I and combined II + III in three age groups.

MEN

Age group	MEANS (ins.) for disability gp. I	II + III	MEAN DIFFERENCES ± S.E (inches)	t	df	P
Under 40 years	68.18 (30)	66.92 (18)	- 1.26 ± 0.769	1.64	46	>.10
40 - 59 years	67.57 (38)	66.05 (151)	- 1.51 ± 0.451	3.35	187	<.01
60 years and over	67.10 (10)	66.30 (117)	- 0.80 ± 0.878	0.91	125	>.30

(After each mean is the actual number of individuals in the group)

TABLE II b. HEIGHT

The Means, Mean Differences, t Values and Probabilities for women, between three disability groups I, II and III in three age groups.

WOMEN

Age group	MEANS (ins.) for disability groups I	II	III	MEAN DIFFERENCES ± S.E (inches)	t	df	P
Under 40 years	63.0	62.6		- 0.41 ± 0.608	0.67	61	> .50
	63.0		61.4	- 1.63 ± 0.803	2.03	36	< 0.05
		62.6	61.4	- 1.22 ± 0.724	1.69	51	> 0.05
	(24)	(39)	(14)				
40 - 59 years	63.5	62.7		- 0.79 ± 0.772	1.02	46	> .30
	63.5		61.5	- 2.01 ± 0.714	2.82	46	< 0.01
		62.7	61.5	- 1.22 ± 0.514	2.37	72	< 0.02
	(11)	(37)	(37)				
60 years and over	64.5	60.9					
	61.3		61.1	- 0.20 ± 0.952	0.21	38	> .80
		60.9	61.1	+ 0.25 ± 0.979	0.26	36	> .70
	(2)	(14)	(24)				

(After each mean is shown the number of individuals in group)

TABLE II c. HEIGHT

The Means, Mean Differences, t Values and Probabilities for women between three disability groups in all ages.

Age group	MEANS (ins.) for disability groups I	II	III	MEAN DIFFERENCES ± S.E (inches)	t	df	P
All ages	63.3	62.4		- 0.87 ± 0.456	1.91	126	> 0.05
		62.4	61.4	- 1.03 ± 0.382	2.70	163	< 0.01
	63.3		61.4	- 1.90 ± 0.486	3.91	110	< 0.01
	(37)	(90)	(75)				

WEIGHT

Table III shows the means, standard deviations and coefficients of variation of body weight by sex, age and disability. Men show, for each age group considered separately, a consistent decline in average body weight with increase of disability. When each disability group is assessed individually in terms of age there is no specific body weight trend. Within each age group the average weights for women show a tendency to diminish with increase in disability, while each disability group considered on its own with reference to age shows for women a positive association between body weight and age. This is particularly noticeable in disability group III where the body weight means are 114.1 lb., 126.0 lb. and 141.4 lb. for the youngest, intermediate and oldest age groups respectively.

Table IV a. assesses the significance of the body weight mean differences with reference to disability. For men the body weight means in each age group are such that the value for group II is less than that for disability group I, and the value for group III is less than that for the disability groups I or II. The mean differences are of significance in the intermediate age group between disability groups II and III ($P < 0.02$) and between disability groups I and III ($P < 0.01$), and in the older age group between disability groups II and III ($P < 0.02$).

For women on the other hand, the comparisons carried out by t test are only eight in number because disability group I in the oldest age group is composed of only two individuals. Of these eight pairs of means studied, within each age group the mean differences in body weight by disability show equal numbers of positive and negative differences. In the youngest age group the signs are negative, and positive in the older age groups.

None of the body weight mean differences for women attain statistical significance.

The absolute and relative variabilities are large, show no consistent trend with age, while the values for women are in general greater than those for men.

Table IV b. assesses the significance of the body weight mean differences for men with reference to additional combinations of disability groups. The mean difference in the youngest age group between disability group I and combined groups II and III, is not significant, but the mean differences are of significance in the intermediate age group between combined disability groups I and II and group III, and also in the oldest age group between the same groups. ($P < 0.01$).

Table V presents body weight means for men derived from disability group III by forming two sub-groups. These sub-groups are A. those without gross evidence of emphysema and B. those with distinct evidence of gross emphysema. In each of the age groups, namely under 50 years, 50 - 59 years, 60 - 69 years, and 70 years and more, the body weight mean for the group of men with emphysema is significantly less than the corresponding body weight average for men with no evidence of emphysema. ($P < 0.01$ in the lowest age group, $P < 0.05$ in all others).

TABLE III WEIGHT

The Means, Standard Deviations, and Coefficients of Variation by sex, age and three disability groups.

Age group	Disability group	No.	MEANS ± S.E (Pounds)	S.D	C.V
MEN					
Under 40 years	I	30	147.0 ± 2.833	15.5	10.6
	II	9	142.9 ± 4.173	12.5	8.8
	III	9	139.1 ± 7.012	21.0	15.1
40 - 59 years	I	38	153.1 ± 3.799	23.4	15.3
	II	62	150.2 ± 3.361	26.5	17.6
	III	89	140.5 ± 2.455	23.2	16.5
60 years and over	I	10	151.2 ± 3.581	11.3	7.5
	II	35	150.4 ± 3.608	21.3	14.2
	III	82	139.2 ± 2.628	23.8	17.1
WOMEN					
Under 40 years	I	24	123.2 ± 4.010	19.6	15.9
	II	39	116.6 ± 2.270	14.2	12.2
	III	14	114.1 ± 7.290	27.3	23.9
40 - 59 years	I	11	122.2 ± 6.708	22.2	18.2
	II	37	133.3 ± 6.112	37.2	27.9
	III	37	126.0 ± 3.443	20.9	16.6
60 years and over	I	2	152.0		
	II	14	137.7 ± 4.248	15.9	11.5
	III	24	141.4 ± 5.747	28.2	19.9

TABLE IV a. WEIGHT

The Means, Mean Differences, t Values and Probabilities for men and women between three disability groups in three age groups.

Age group	MEANS (lbs) for disability group I	II	III	MEAN DIFFERENCES ± S.E (lbs)	t	df	P
MEN							
Under 40 years	147.0	142.9		- 4.11 ± 8.728	0.47	37	>.60
		142.9	139.1	- 3.78 ± 14.090	0.27	16	>.70
	147.0		139.1	- 7.89 ± 6.409	1.23	37	>.20
	(30)	(9)	(9)				
40 - 59 years	153.1	150.2		- 2.90 ± 5.223	0.56	98	>.50
		150.2	140.5	- 9.71 ± 4.063	2.39	149	<0.02
	153.1		140.5	- 12.62 ± 4.503	2.80	125	<0.01
	(38)	(62)	(89)				
60 years and over	151.2	150.4		- 0.80 ± 7.056	0.11	43	>.90
		150.4	139.2	- 11.23 ± 4.664	2.41	115	<0.02
	151.2		139.2	- 12.03 ± 7.319	1.64	90	>.10
	(10)	(35)	(82)				
WOMEN							
Under 40 years	123.2	116.6		- 6.61 ± 4.265	1.55	61	>.10
		116.6	114.1	- 2.52 ± 5.735	0.44	51	>.60
	123.2		114.1	- 9.13 ± 7.631	1.20	36	>.20
	(24)	(39)	(14)				
40 - 59 years	122.2	133.3		+ 11.09 ± 7.338	1.51	46	>.10
		133.3	126.0	- 7.24 ± 4.887	1.48	72	>.10
	122.2		126.0	+ 3.85 ± 7.291	0.53	46	>.50
	(11)	(37)	(37)				
60 years and over		137.7	141.4	+ 3.67 ± 8.219	0.45	36	>.60
	139.4		141.4	+ 1.94 ± 7.760	0.25	38	>.80
	(2) + (14)		(24)				

(After each mean is shown in bracket the number in the group)

TABLE IV b. WEIGHT

The Means, Mean Differences, t Values and Probabilities for additional combinations of disability groups for men in three age groups.

MEN

Age group	MEANS (lbs) for disability groups		MEAN DIFFERENCES $\pm$ S.E (lbs)	t	df	P
	I	II + III				
Under 40 years	147.0 (30)	141.0 (18)	$-$ 6.0 $\pm$ 6.680	.90	46	$>.30$
	I + II	III				
40 - 59 years	151.3 (100)	140.5 (89)	$-$ 10.8 $\pm$ 3.541	3.06	187	<0.01
	I + II	III				
60 years and over	150.6 (45)	139.2 (82)	$-$ 11.4 $\pm$ 4.142	2.75	125	<0.01

(In brackets are the numbers in the group for each mean)

TABLE V. BODY WEIGHT

The Means, Mean Differences, t Values and Probabilities for two sub-groups formed from disability group III. These sub-groups are A. Individuals without emphysema and B. individuals with emphysema.

MEN

Age group (years)	Means (lb.) Subgroup A	Subgroup B	Mean Differences ± S.E (lb.)	t	df	P
Less than 50	147.4 (16)	122.9 (9)	- 24.5 ± 5.56	4.40	23	<0.01
50 -59	145.8 (42)	134.4 (31)	- 11.4 ± 5.67	2.01	71	<0.05
60 - 69	147.0 (36)	134.4 (27)	- 12.6 ± 5.91	2.14	61	<0.05
70 and more	143.3 (8)	122.4 (11)	- 20.9 ± 9.36	2.23	17	<0.05

(After each mean in brackets appear the number of individuals in group)

SYSTOLIC BLOOD PRESSURE

Table VI shows the means, standard deviations and coefficients of variation of systolic blood pressure by sex, age and disability. For men there is a marked increase in average systolic blood pressure with age and this is observed in each of the three disability groups. For example, the mean systolic blood pressure in the youngest age group for disability group I is 135.3 mm.Hg, in intermediate age group 151.0 mm. Hg and in the oldest age group the corresponding mean systolic blood pressure is 166.0 mm. Hg.

When each age group is considered separately for men, the mean systolic blood pressure is comparable in each of the disability groups I, II and III.

For women a marked increase of average systolic blood pressure with age is observed in each of the three disability groups. For instance, in disability group III the mean systolic blood pressure in the youngest age group is 136.4 mm. Hg, in the intermediate age group 155.8 mm.Hg, and the corresponding mean systolic blood pressure in the oldest age group is 190.9 mm. Hg.

Considering each age group separately, the average systolic blood pressure for women increases with disability increase. For example in the intermediate age group, the mean is 141.3 mm.Hg in disability group I, 154.1 in disability group II and 155.8 mm.Hg in disability group III.

Table VI a. assesses for women the significance of the mean differences in systolic blood pressure, contrasting eight ways the values in disability groups I, II and III for each of three age groups. In each case there is an increase, but none attains a level of significance. Nevertheless, consistent positive signs for the mean differences suggest that increase of disability is associated with a rise of Systolic Blood Pressure.

The absolute and relative variabilities in men increase with age for each disability group and in women the absolute and relative variabilities seem to show a similar trend.

Within each age group there is no consistent change in absolute or relative variability with increase of disability.

TABLE VI. SYSTOLIC BLOOD PRESSURE

The Means, Standard Deviations and Coefficients of Variation by sex, age and three disability groups.

Age group	Disability group	No.	MEANS ± S.E (mm. Mercury)	S.D	C.V
MEN					
Under 40 years	I	30	135.3 ± 2.630	14.4	10.7
	II	9	130.4 ± 4.581	13.7	10.5
	III	9	137.3 ± 5.745	17.2	12.6
40 - 59 years	I	38	151.0 ± 3.864	23.8	15.8
	II	62	149.9 ± 3.321	26.1	17.4
	III	89	147.9 ± 2.454	23.2	15.7
60 years and over	I	10	166.0 ± 9.870	31.2	18.8
	II	35	164.1 ± 4.862	28.8	17.5
	III	82	162.6 ± 2.941	26.6	16.4
WOMEN					
Under 40 years	I	24	127.0 ± 2.902	14.2	11.2
	II	39	129.1 ± 2.217	13.8	10.7
	III	14	136.4 ± 6.422	24.0	17.6
40 - 59 years	I	11	141.3 ± 5.218	17.3	12.3
	II	37	154.1 ± 4.589	27.9	18.1
	III	37	155.8 ± 3.764	22.9	14.7
60 years and more	I	2	207.0		
	II	14	179.6 ± 7.100	26.6	14.8
	III	24	190.9 ± 5.855	28.7	15.0

TABLE VIa. SYSTOLIC BLOOD PRESSURE

The Means, Mean Differences, t Values and Probabilities for women between three disability groups in three age groups.

WOMEN

Age group	MEANS (mm.Hg) for disability groups I	II	III	MEAN DIFFERENCES ± S.E (mm. Mercury)	t	df	P
Under 40 years	127.0	129.1		+ 2.13 ± 3.626	0.59	61	>.50
		129.1	136.4	+ 7.30 ± 5.304	1.38	51	>.10
	127.0		136.4	+ 9.43 ± 6.177	1.53	36	>.10
	(24)	(39)	(14)				
40 - 59 years	141.3	154.1		+ 12.78 ± 8.922	1.43	46	>.10
		154.1	155.8	+ 1.76 ± 5.933	0.30	72	>.70
	141.3		155.8	+ 14.54 ± 7.487	1.94	46	>0.05
	(11)	(37)	(37)				
60 years and over		179.6	190.9	+ 11.31 ± 9.409	1.20	36	>.20
	183.0		190.9	+ 7.88 ± 9.489	0.83	38	>.40
	(2)	(14)	(24)				

(In bracket after each mean is number of individuals in group)

DIASTOLIC BLOOD PRESSURE

Table VII shows the means, standard deviations and coefficients of variation of diastolic blood pressure by sex, age and disability groups.

For men, each of the three disability groups present average diastolic blood pressure values which increase with age. For example in disability group II, the diastolic blood pressure means are 86.9 mm., 92.9 mm. and 95.8 mm. Hg. for the youngest, intermediate and oldest age groups respectively. It is reasonable to conclude therefore, that there is a weak positive association between age and diastolic blood pressure, although analyses of variance (Table VIIa.) show that the differences between the means lack significance.

For women there is a similar upward trend of diastolic blood pressure with increase of age, in each of the three disability groups. For example, in disability group III the diastolic blood pressure means are 85.0 mm., 96.0 mm. and 102.5 mm. Hg. for the youngest, intermediate and oldest age groups respectively.

For men, a study of each age group taken separately, indicates that there is no consistent trend in diastolic blood pressure with increase of disability, except in the youngest age group where the diastolic blood pressure increases with disability from 81.8 mm. Hg in disability group I to 88.7 mm. Hg in disability group III.

However, women show a distinct increase in average diastolic blood pressure with disability in each age group.

Table VIIb. assesses the significance of diastolic blood pressure mean differences for women. The mean differences are all positive in sign and are significant between disability groups I and III in the intermediate age group ($P < 0.05$) and between disability groups II and III in the oldest age group ($P < 0.05$).

The small number of cases in disability group I do not allow of statistical comparison.

The absolute and relative variabilities are comparable for men and women, fluctuate considerably, and show no consistent trend by age or by disability.

TABLE VII. DIASTOLIC BLOOD PRESSURE

The Means, Standard Deviations and Coefficients of Variation by sex, age and three disability groups.

Age group	Disability group	No.	MEANS ± S.E (mm.Hg)	S.D	C.V
MEN					
Under 40 years	I	30	81.8 ± 2.260	12.4	15.1
	II	9	86.9 ± 2.648	7.9	9.1
	III	9	88.7 ± 2.828	8.5	9.6
40 - 59 years	I	38	92.1 ± 2.395	14.8	16.0
	II	62	92.9 ± 1.840	14.5	15.6
	III	89	92.8 ± 1.313	12.4	13.3
60 years and over	I	10	92.2 ± 4.377	13.8	15.0
	II	35	95.8 ± 2.441	14.4	15.1
	III	82	91.9 ± 1.440	13.0	14.2
WOMEN					
Under 40 years	I	24	81.5 ± 1.665	8.2	10.0
	II	39	83.0 ± 1.876	11.7	14.1
	III	14	85.0 ± 3.300	12.3	14.5
40 - 59 years	1	11	89.1 ± 2.946	9.8	11.0
	II	37	93.6 ± 2.368	14.4	15.4
	III	37	96.0 ± 1.600	9.7	10.1
60 years and over	I	2	111.0		
	II	14	93.0 ± 1.607	6.0	6.5
	III	24	102.5 ± 3.263	16.0	15.6

TABLE VII a. DIASTOLIC BLOOD PRESSURE

Analyses of Variance for three age groups, for men by disability group.

MEN 1. Disability group I

Source of variation	Sum of squares	df	Mean Square
Between groups	1952	2	97.6
Within groups	14235	75	189.8
Total	16187	77	

Variance Ratio = 0.51

2. Disability group II

Source of variation	Sum of squares	df	Mean square
Between groups	601	2	300.5
Within groups	20402	103	198.08
Total	21003	105	

Variance Ratio = 1.52

3. Disability group III

Source of variation	Sum of squares	df	Mean square
Between groups	152	2	76.0
Within groups	27854	177	157.37
Total	28006	179	

Variance Ratio = 0.48

In none of the age groups are the variations significant.

TABLE VII b. DIASTOLIC BLOOD PRESSURE

The Means, Mean Differences, t Values and Probabilities for women between three disability groups in three age groups.

WOMEN

Age Group	MEANS (mm.Hg) for disability groups I	II	III	MEAN DIFFERENCES ± S.E (mm.Hg)	t	df	P
Under 40 years	81.5	83.0		+ 1.47 ± 2.718	0.54	61	>.50
		83.0	85.0	+ 2.03 ± 3.699	0.55	51	>.50
	81.5		85.0	+ 3.50 ± 3.302	1.06	36	>.20
	(24)	(39)	(14)				
40 - 59 years	89.1	93.6		+ 4.53 ± 4.648	0.97	46	>.30
		93.6	96.0	+ 2.33 ± 2.857	0.82	72	>.40
	89.1		96.0	+ 6.86 ± 3.346	2.05	46	<0.05
	(11)	(37)	(37)				
60 years and over		93.0	102.5	+ 9.54 ± 4.464	2.14	36	<0.05
	95.3		102.5	+ 7.29 ± 4.491	1.62	38	>.10
	(2)	(14)	(24)				

(In bracket after each mean is number of individuals in group)

CHEST GIRTH - MAXIMUM

Table VIII shows the means, standard deviations and coefficients of variation of Maximum Chest Girth by sex, age and disability.

For each sex and each age group there is no significant variation in the means of maximum chest girth between the three disability groups. When each disability group is considered separately in terms of age, the men have maximum chest girth means which do not differ materially, while the women have maximum chest girth means which increase with age. For example for women in disability group III, the maximum chest girth means increase from 34.3 ins. in the youngest age group, 35.8 ins. in the intermediate age group to 36.9 ins. in the oldest age group.

The analyses of variance (Table VIIIa.) show that the mean differences for men by age for three disability groups are not significant.

While the analyses of variance (Table VIIIb.) indicate that the mean differences by age are not significant for women, the consistent trends in the three disability groups suggest that for women an increase in average maximum chest girth is possibly to be expected with age.

For men, a comparison of the non-emphysematous and emphysematous sub-groups formed from disability group III, shows that the group of men with emphysema have maximum chest girth means which are significantly less than the corresponding means for the group of men without emphysema (Table IX). Under sixty years the men without and with emphysema have maximum chest girth means respectively of 37.1 in. and 35.7 in. ($P < 0.01$). In the group of men aged 60 years and more, the corresponding maximum chest girth means are respectively 36.8 in. and 35.7 in. ($P < 0.05$).

TABLE VIII. CHEST GIRTH "MAXIMUM"

The Means, Standard Deviations and Coefficients of Variation, by sex and age in three disability groups.

Age group	Disability group	No.	MEANS ± S.E (inches)	S.D	C.V
MEN					
Under 40 years	I	30	36.3 ± 0.346	1.9	5.2
	II	9	35.8 ± 1.748	5.2	14.7
	III	9	36.5 ± 0.589	1.8	4.8
40 - 59 years	I	38	37.1 ± 0.466	2.9	7.7
	II	62	37.4 ± 0.381	3.0	8.0
	III	89	36.6 ± 0.255	2.4	6.6
60 years and more	I	10	36.9 ± 0.379	1.2	3.2
	II	35	37.0 ± 0.472	2.8	7.6
	III	82	36.3 ± 0.281	2.5	7.0
WOMEN					
Under 40 years	I	24	34.3 ± 0.344	1.7	4.9
	II	39	34.2 ± 0.308	1.9	5.6
	III	14	34.3 ± 0.920	3.4	10.0
40 - 59 years	I	11	34.7 ± 0.799	2.6	7.6
	II	37	36.0 ± 0.355	2.2	6.0
	III	37	35.8 ± 0.408	2.5	6.9
60 years and more	I	2	38.5		
	II	14	36.7 ± 0.462	1.7	4.7
	III	24	36.9 ± 0.621	3.0	8.2

TABLE VIII a. "MAXIMUM" GIRTH OF CHEST

Analyses of Variance for men in three disability groups by age groups.

MEN

1. Age group under 40 years

Source of variation	Sum of squares	df	Mean square
Between groups	2.74	2	1.37
Within groups	349.26	45	7.761
Total	352.00	47	

Variance Ratio = 0.18

2. Age group 40 - 59 years

Source of variation	Sum of squares	df	Mean square
Between groups	24.37	2	12.19
Within groups	1364.42	186	7.336
Total	1388.79	188	

Variance Ratio = 1.66

3. Age group 60 years and more

Source of variation	Sum of squares	df	Mean square
Between groups	14.32	2	7.16
Within groups	802.77	124	6.47
Total	817.09	126	

Variance Ratio = 1.11

In none of the age groups is the variation significant.

TABLE VIII b. "MAXIMUM" CHEST CIRCUMFERENCE

Analyses of Variance for women, for three disability groups by age group.

WOMEN

1. Age group under 40 years

Source of variation	Sum of squares	df	Mean square
Between groups	0.13	2	.065
Within groups	360.17	74	4.867
Total	360.3	76	

Variance Ratio = 0.013

2. Age group 40 - 59 years

Source of variation	Sum of squares	df	Mean square
Between groups	15.36	2	7.68
Within groups	458.94	82	5.784
Total	474.30	84	

Variance Ratio = 1.33

3. Age group 60 years and more

Source of variation	Sum of squares	df	Mean square
Between groups	5.78	2	2.89
Within groups	264.32	37	7.144
Total	270.1	39	

Variance Ratio = 0.40

In none of the age groups is the variation significant.

TABLE IX. MAXIMUM CHEST CIRCUMFERENCE

The Means, Mean Differences, t Values and Probabilities for men for the two sub-groups formed from disability group III, being

A. Individuals without emphysema and B. Individuals with emphysema.

MEN

Age group years	MEANS (inches) for		MEAN DIFFERENCES $\pm$ S.E (inches)	t	df	P
	Subgroup A	Subgroup B				
Under 60	37.1 (58)	35.7 (40)	- 1.5 $\pm$ 0.462	3.14	96	<0.01
60 and more	36.8 (44)	35.7 (38)	- 1.2 $\pm$ 0.552	2.12	80	<0.05

(In bracket under each mean is the number of individuals in group)

"DIAPHRAGMATIC CHEST GIRTH"

Table X shows the means, standard deviations and co-efficients of variation of Diaphragmatic Chest Girth by sex, age and disability. In general the sexes when considered by age groups present no significant variations in diaphragmatic chest girth means with increase of disability. There is one exception and that is found in the men aged sixty years and more, where analysis of variance indicates that the diaphragmatic chest girth means differ significantly (Table Xa.). The tendency in the three age groups is for men in disability group III to have the means of smallest value but this is not noted for women.

When each disability group is considered separately in terms of age, the men present diaphragmatic chest girth means which do not differ markedly while the women show diaphragmatic chest girth means which increase with age. For example, with women in disability group III the diaphragmatic chest girth means increase from 29.9 in. in the youngest age group through 32.5 in. in the intermediate group to 34.5 in. in the oldest age group.

For men a comparison of the non-emphysematous and emphysematous sub-groups formed from disability group III shows that the group of men with emphysema have diaphragmatic chest girth means which are significantly less than the corresponding means for the group of men without emphysema (Table XI). Under sixty years of age the men without and with emphysema have diaphragmatic chest girth means of 34.4 in.

and 32.1 in. respectively ($P < 0.01$). In the group of men aged sixty years and more the corresponding diaphragmatic chest girth means are 34.0 in. and 32.3 in. ($P < 0.02$).

The absolute and relative variabilities of maximum and diaphragmatic chest girths show no marked changes by sex, age or disability. However, in both sexes the absolute and relative variabilities of diaphragmatic chest girth are slightly greater than the corresponding values of maximum chest girth.

TABLE X. "DIAPHRAGMATIC" CHEST GIRTH

The Means, Standard Deviations and Coefficients of Variation by sex, and age in three disability groups.

Age group	Disability group	No.	MEANS ± S.E (inches)	S.D	C.V
MEN					
Under 40 years	I	30	32.6 ± 0.459	2.5	7.7
	II	9	33.4 ± 2.163	6.5	19.4
	III	9	31.8 ± 0.817	2.4	7.7
40 - 59 years	I	38	34.0 ± 0.551	3.4	10.0
	II	62	34.1 ± 0.458	3.6	10.6
	III	89	33.7 ± 0.347	3.3	9.7
60 years and more	I	10	34.7 ± 0.746	2.4	6.8
	II	35	34.9 ± 0.578	3.4	9.8
	III	82	33.2 ± 0.356	3.2	9.7
WOMEN					
Under 40 years	I	24	30.5 ± 0.456	2.2	7.3
	II	39	29.8 ± 0.347	2.2	7.3
	III	14	29.9 ± 0.885	3.3	11.1
40 - 59 years	I	11	31.1 ± 1.265	4.2	13.5
	II	37	32.3 ± 0.525	3.2	9.9
	III	37	32.5 ± 0.493	3.0	9.2
60 years and more	I	2	34.3		
	II	14	34.1 ± 0.576	2.2	6.3
	III	24	34.5 ± 0.847	4.2	12.0

TABLE X a. "DIAPHRAGMATIC" CHEST GIRTH

Analyses of Variance for three grades of disability, for men in three age groups.

MEN

1. Age group under 40 years

Source of variation	Sum of squares	df	Mean square
Between groups	11.76	2	5.88
Within groups	567.91	45	12.62
Total	599.67	47	

Variance Ratio = 0.47 The differences are not significant.

2. Age group 40 - 59 years

Source of variation	Sum of squares	df	Mean square
Between groups	9.63	2	4.82
Within groups	2173.37	186	11.69
Total	2183.00	188	

Variance Ratio = 0.41 The differences are not significant.

3. Age group 60 years and more

Source of variation	Sum of squares	df	Mean square
Between groups	73.91	2	36.96
Within groups	1286.89	124	10.38
Total	1360.80	126	

Variance Ratio = 3.56

For oldest age group,

for $v_1 = 2$ and $v_2 = 124$, the 5% point of the variance ratio is 3.07

Therefore the difference between the means for the three disability groups is significant.

TABLE X b. "DIAPHRAGMATIC" CHEST GIRTH

Analyses of Variance for three disability groups, for women in three age groups.

WOMEN

1. Age group under 40 years

Source of variation	Sum of squares	df	Mean square
Between groups	8.44	2	4.22
Within groups	435.23	74	5.88
Total	443.67	76	

Variance Ratio = 0.72

2. Age group 40 - 59 years

Source of variation	Sum of squares	df	Mean square
Between groups	14.92	2	7.46
Within groups	866.23	82	10.564
Total	881.15	84	

Variance Ratio = 0.71

3. Age group 60 years and more

Source of variation	Sum of squares	df	Mean square
Between groups	1.8	2	0.9
Within groups	492.8	37	13.319
Total	494.6	39	

Variance Ratio = 0.068

In none of the age groups are the variations significant.

TABLE XI. "DIAPHRAGMATIC" CHEST GIRTH

The Means, Mean Differences, t Values and Probabilities for the two sub-groups formed from disability group III for men, namely A. Those individuals without emphysema and B. Those with emphysema.

MEN

Age group (years)	MEANS (inches) for Subgroup A	Subgroup B	MEAN DIFFERENCES ± S.E (inches)	t	df	P
Under 60	34.1 (58)	32.1 (40)	− 2.3 ± 0.629	3.7	96	<0.01
60 and more	34.0 (44)	32.3 (38)	− 1.7 ± 0.692	2.43	80	<0.02

(In bracket under each mean is the number of individuals in the group)

"MAXIMUM" CHEST EXPANSION

Table XII shows the means, standard deviation and coefficients of variation of "Maximum" Chest Expansion by sex, age and disability. For each sex there is a diminution in average maximum chest expansion with increase of disability in each age group. In general the maximum chest expansion means of disability group II approximate more closely to the corresponding means of disability group III than to those of disability group I.

Each disability group shows a decrease in average maximum chest expansion with age. This is more marked for women than for men. For example, in disability group II the mean chest expansion values are 1.8 in. in the youngest age group, 1.6 in. in the intermediate age group and 1.2 in. in the oldest age group for women; whereas the corresponding figures for men in the three age groups are 1.9 in., 1.6 in. and 1.5 in. In all groups the mean maximum chest expansion for women is less than the corresponding average for men.

Table XIIIa. assesses the significance of the mean differences of maximum chest expansion in each age group comparing the three disability groups by sex. Statistical levels of significance are reached for men in the youngest age group between disability groups I and III ($P < 0.01$), and in the intermediate age group between disability groups I and II; and between groups I and III (in each case $P < 0.01$); also between groups II and III ($P < 0.02$). However in the oldest age group none of the combinations gives a mean difference which is significant.

For women all combinations fail to reach significance excepting the difference in the intermediate age group between disability groups I and III ($P < 0.01$). Table XIII b.

The absolute variability is small and shows no marked variation by disability or age. Sex variation seems unremarkable. The relative variability is very large and for men may diminish with increase in age when each disability group is considered individually, but the reverse seems to be the case for women who show an appreciable increase with age for each disability group.

TABLE XII. "MAXIMUM" CHEST EXPANSION

The Means, Standard Deviations and Coefficients of Variation by sex, age and three disability groups.

Age group	Disability group	No.	MEANS ± S.E (inches)	S.D	C.V
MEN					
Under 40 years	I	30	2.2 ± 0.106	0.6	26.7
	II	9	1.9 ± 0.417	1.3	64.4
	III	9	1.8 ± 0.289	0.9	47.2
40 - 59 years	I	38	2.0 ± 0.072	0.4	22.3
	II	62	1.6 ± 0.087	0.7	42.6
	III	89	1.4 ± 0.057	0.5	39.2
60 years and more	I	10	1.8 ± 0.091	0.3	16.5
	II	35	1.5 ± 0.053	0.3	20.8
	III	82	1.5 ± 0.062	0.6	38.2
WOMEN					
Under 40 years	I	24	1.9 ± 0.095	0.5	24.0
	II	39	1.8 ± 0.111	0.7	38.2
	III	14	1.7 ± 0.107	0.4	24.1
40 - 59 years	I	11	1.9 ± 0.166	0.6	29.7
	II	37	1.6 ± 0.097	0.6	38.2
	III	37	1.4 ± 0.072	0.4	31.8
60 years and more	I	2	1.1		
	II	14	1.2 ± 0.131	0.5	40.4
	III	24	1.1 ± 0.086	0.4	37.1

TABLE XIII a. "MAXIMUM" CHEST EXPANSION

The Means, Mean Differences, t Values and Probabilities for disability groups variously compared for men in three age groups.

MEN

Age group	MEANS (in.) for disability groups I	II	III	MEAN DIFFERENCES ± S.E (inches)	t	df	P
Under 40 years	2.2	1.9		- 0.24 ± 0.290	0.83	37	>.40
		1.9	1.8	- 0.11 ± 0.496	0.22	16	>.80
	2.2		1.8	- 0.35 ± 0.163	2.15	37	<0.05
	(30)	(9)	(9)				
40 - 59 years	2.0	1.6		- 0.38 ± 0.140	2.74	98	<0.01
		1.6	1.4	- 0.25 ± 0.099	2.47	149	<0.02
	2.0		1.4	- 0.63 ± 0.112	5.63	125	<0.01
	(38)	(62)	(89)				
60 years and more	1.8	1.5		- 0.26 ± 0.184	1.40	43	>.10
		1.5	1.5	- 0.01 ± 0.114	0.13	115	>.80
	1.8		1.5	- 0.27 ± 0.182	1.49	90	>.10
	(10)	(35)	(82)				

(In bracket under each mean is the number of individuals in group)

TABLE XIII b. "MAXIMUM" CHEST EXPANSION

The Means, Mean Differences, t Values and Probabilities for three disability groups for women by three age groups.

WOMEN

Age group	MEANS (in.) for disability groups I	II	III	MEAN DIFFERENCES ± S.E (inches)	t	df	P
Under 40 years	1.9	1.8		- 0.12 ± 0.120	1.00	61	>.30
		1.8	1.7	- 0.15 ± 0.140	1.07	51	>.20
	1.9		1.7	- 0.27 ± 0.148	1.82	36	>.05
	(24)	(39)	(14)				
40 - 59 years	1.9	1.6		- 0.31 ± 0.201	1.55	46	>.10
		1.6	1.4	- 0.17 ± 0.121	1.40	72	>.10
	1.9		1.4	- 0.48 ± 0.160	3.00	46	<.01
	(11)	(37)	(37)				
60 years and more		1.2	1.1	- 0.07 ± 0.172	0.41	36	>.60
	1.2		1.1	- 0.06 ± 0.161	0.37	38	>.70
	(2)	(14)	(24)				

(In bracket under each mean is the number of individuals in group)

"DIAPHRAGMATIC" CHEST EXPANSION

Table XIV shows the means, standard deviations and coefficients of variation of "Diaphragmatic" Chest Expansion by sex, age and disability. For each sex in each age group there is a diminution in average diaphragmatic chest expansion with increase of disability except in the oldest age group where disability group I shows a mean value too low to be in keeping with this general statement.

For each disability group there is a decrease in average diaphragmatic chest expansion with age. This is true for women and in disability group I for men, but is not observed for men in disability groups II and III. There is a marked difference between the means for each sex, most distinct in the older age groups and for those who are more disabled.

Table XIVa. assesses the significance of the mean differences in diaphragmatic chest expansion in each age group comparing the three disability groups by sex.

For men statistical levels of significance are attained in the youngest age group between disability groups I and III ($P < 0.01$); in the intermediate age group between disability groups I and II ($P < 0.02$), and disability groups II and III ($P < 0.01$), but in the oldest age group all mean differences lack significance.

For women, the mean differences in diaphragmatic chest expansion reach statistical significance in the following comparisons: in the youngest age group between disability groups I and III ($P \geq 0.05$), in the intermediate age group between disability groups I and II ($P < 0.01$), and between disability groups I and III ($P < 0.01$). The differences are not significant in the oldest age group for women.

The absolute variability is small and relative variability is extremely large. Neither shows any consistent variation with age or disability.

TABLE XIV. "DIAPHRAGMATIC" CHEST EXPANSION

The Means, Standard Deviations and Coefficients of Variation by sex, age and three disability groups.

Age group	Disability group	No.	MEANS ± S.E (inches)	S.D	C.V
MEN					
Under 40 years	I	30	2.64 ± 0.163	0.89	33.9
	II	9	1.61 ± 0.321	0.96	59.8
	III	9	1.61 ± 0.209	0.63	38.9
40 - 59 years	I	38	2.37 ± 0.154	0.95	40.0
	II	62	1.94 ± 0.101	0.80	41.0
	III	89	1.55 ± 0.090	0.85	54.8
60 years and more	I	10	1.53 ± 0.202	0.64	41.9
	II	35	1.75 ± 0.138	0.82	46.6
	III	82	1.70 ± 0.086	0.78	46.1
WOMEN					
Under 40 years	I	24	2.0 ± 0.138	0.68	33.7
	II	39	1.7 ± 0.144	0.90	54.0
	III	14	1.6 ± 0.135	0.50	32.1
40 - 59 years	I	11	2.2 ± 0.292	0.97	44.4
	II	37	1.3 ± 0.127	0.77	62.6
	III	37	1.2 ± 0.118	0.72	58.5
60 years and more	I	2	0.6		
	II	14	1.1 ± 0.116	0.44	38.6
	III	24	0.8 ± 0.088	0.43	54.8

TABLE XIV a. "DIAPHRAGMATIC" CHEST EXPANSION

The Means, Mean Differences, t Values and Probabilities for three disability groups for men by three age groups.

MEN

Age group	MEANS (in.) for disability groups I	II	III	MEAN DIFFERENCES ± S.E (inches)	t	df	P
Under 40 years	2.6	2.2		− 0.48 ± 0.346	1.38	37	$>.10$
		2.2	1.6	− 0.56 ± 0.383	1.45	16	$>.10$
	2.6		1.6	− 1.03 ± 0.321	3.21	37	<0.01
	2.6	1.9		− 0.75 ± 0.261	2.88	46	<0.01
	(30)	(9)	(9)				
40 − 59 years	2.4	1.9		− 0.43 ± 0.176	2.43	98	<0.02
		1.9	1.6	− 0.39 ± 0.137	2.84	149	<0.01
	2.1		1.6	− 0.57 ± 0.278	2.88	46	<0.01
	(38)	(62)	(89)				
60 years and more	1.5	1.8		+ 0.23 ± 0.281	0.80	43	$>.40$
		1.8	1.7	− 0.05 ± 0.160	0.03	115	$>.90$
	1.5	1.7		+ 0.19 ± 0.391	0.48	125	$>.60$
	(10)	(35)	(82)				

(In bracket under each mean is the number of individuals in group)

TABLE XIV b. "DIAPHRAGMATIC" CHEST EXPANSION

The Means, Mean Differences, t Values and Probabilities for three disability groups for women by three age groups.

WOMEN

Age group	MEANS (in.) for disability groups			MEAN DIFFERENCES ± S.E (inches)	t	df	P
	I	II	III				
Under 40 years	2.0	1.7		- 0.34 ± 0.214	1.59	61	>.10
		1.7	1.6	- 0.10 ± 0.259	0.39	51	>.60
	2.0		1.6	- 0.44 ± 0.216	2.04	36	<0.05
	(24)	(39)	(14)				
40 - 59 years	2.2	1.3		- 0.86 ± 0.281	3.06	46	<0.01
		1.3	1.2	- 0.09 ± 0.173	0.52	72	>.60
	2.2		1.2	- 0.95 ± 0.268	3.54	46	<0.01
	(11)	(37)	(37)				
60 years and more		1.1	0.8	- 0.34 ± 0.198	1.72	36	>0.05
	1.1		0.8	- 0.27 ± 0.205	1.32	38	>.10
	(2)	(14)	(24)				

(In bracket under each mean is the number of individuals in group)

VERTICAL HEIGHT OF LEFT HEMITHORAX ON INSPIRATION

Table XV shows the means, standard deviations and coefficients of variation of vertical height of left hemithorax by sex, age and disability.

For men within each age group there is no consistent increase in average left hemithoracic height with increase of disability, although for each of the three age groups the mean vertical height in disability group III is greater than either of the corresponding means for disability groups I or II. In each case the lowest mean value is found in the middle grade of disability.

For women on the other hand, lower means are observed than for men, and a uniform increase of mean left hemithoracic vertical height is observed with increasing disability in all age groups.

No consistent trend for either sex is observed with age within disability groups.

Table XVIa. gives an assessment of the significance of the mean differences in vertical height of left hemithorax for men in the three age groups between various combinations of disability group.

For men in each age group the differences are significant and positive in sign when comparing disability group III and the corresponding mean of disability group II. in the youngest age group ($P < 0.05$), in intermediate age group ($P < 0.01$), and also in the oldest age group ($P < 0.01$). When disability groups II and I are compared the mean difference is only significant in the youngest age group ($P < 0.02$) and in all comparisons the sign is negative.

For women significance is found only in the oldest age group in the mean difference between disability groups II and III ($P < 0.05$). However, the trend is uniform albeit of small magnitude. (Table XVI b.).

There is little variation in the absolute variability by age or disability. The relative variability is moderate and little influenced by age or disability. The values for women on the whole are lower than for men.

TABLE XV. VERTICAL HEIGHT OF LEFT HEMITHORAX

The Means, Standard Deviations and Coefficients of Variation by sex, age and three grades of disability.

Age group	Disability group	No.	MEANS ± S.E (cms.)	S.D	C.V
MEN					
Under 40 years	I	30	25.2 ± 0.413	2.3	9.0
	II	9	24.5 ± 0.861	2.6	10.5
	III	9	27.3 ± 0.619	1.9	6.8
40 - 59 years	I	38	26.1 ± 0.390	2.4	9.2
	II	62	25.6 ± 0.311	2.5	9.6
	III	89	26.9 ± 0.207	2.0	7.3
60 years and more	I	10	26.1 ± 0.924	2.9	11.2
	II	35	25.6 ± 0.355	2.1	8.2
	III	82	27.2 ± 0.273	2.5	9.1
WOMEN					
Under 40 years	I	24	23.4 ± 0.287	1.4	6.0
	II	39	23.6 ± 0.261	1.6	6.9
	III	14	23.7 ± 0.372	1.4	5.9
40 - 59 years	I	11	23.5 ± 0.692	2.3	9.8
	II	37	23.5 ± 0.407	2.5	10.5
	III	37	23.8 ± 0.267	1.6	6.8
60 years and more	I	2	24.0		
	II	14	21.9 ± 0.475	1.8	8.1
	III	24	23.3 ± 0.405	2.0	8.5

TABLE XVI a. VERTICAL DIAMETER OF LEFT HEMITHORAX

The Means, Mean Differences, t Values and Probabilities for three disability groups in various combinations for men in three age groups.

MEN

Age group	MEANS (cms.) for disability groups I	II	III	MEAN DIFFERENCES ± S.E (cms.)	t	df	P
Under 40 years	25.2	24.5		- 2.04 ± 0.829	2.45	37	<0.02
		24.5	27.3	+ 2.73 ± 1.060	2.58	16	<0.05
	25.1		27.3	+ 2.20 ± 0.832	2.64	46	<0.01
	(30)	(9)	(9)				
40 - 59 years	26.1	25.6		- 0.49 ± 0.815	0.60	98	>.50
		25.6	26.9	+ 1.28 ± 0.359	3.57	149	<0.01
	26.1		26.9	+ 0.79 ± 0.406	1.95	125	>0.05
	25.8		26.9	+ 1.10 ± 0.740	1.48	187	>.10
	(38)	(62)	(89)				
60 years and more	26.1	25.5		- 0.52 ± 0.824	0.64	43	>.50
		25.5	27.2	+ 1.69 ± 0.479	3.54	115	<0.01
	26.1		27.2	+ 1.27 ± 0.845	1.50	90	>.10
	25.7		27.2	+ 1.58 ± 0.447	3.53	125	<0.01
	(10)	(35)	(82)				

(In bracket under each mean is the number of individuals in group).

TABLE XVI b. VERTICAL DIAMETER OF LEFT HEMITHORAX

The Means, Mean Differences, t Values and Probabilities for three disability groups in various combinations for women in three age groups.

WOMEN

Age group	MEANS (cms.) for disability groups I	II	III	MEAN DIFFERENCES ± S.E (cms.)	t	df	P
Under 40 years	23.4	23.6		+ 0.24 ± 0.407	0.59	61	>.50
		23.6	23.7	+ 0.11 ± 0.490	0.22	51	>.80
	23.4		23.7	+ 0.35 ± 0.484	0.72	36	>.40
	(24)	(39)	(14)				
40 - 59 years	23.5		23.8	+ 0.26 ± 0.614	0.42	46	>.60
	23.5	23.5		+ 0.05 ± 0.838	0.06	46	>.90
		23.5	23.8	+ 0.21 ± 0.487	0.43	72	>.60
	(11)	(37)	(37)				
60 years and more		21.9	23.3	+ 1.45 ± 0.643	2.26	36	<0.05
	22.1		23.3	+ 1.19 ± 0.620	1.92	38	>0.05
	(2)	(14)	(24)				

(In bracket below each mean is the number of individuals in the group).

VERTICAL HEIGHT OF RIGHT HEMITHORAX ON INSPIRATION

Table XVII shows the means, standard deviations and coefficients of variation of vertical height of right hemithorax by sex, age and disability.

The general trends outlined for the vertical height of the left hemithorax apply when the vertical height of the right hemithorax is considered. Within each age group for men the right hemithoracic height means approximate for disability groups I and II, with disability group I showing the means of higher value, while the disability group III mean is distinctly greater than either of the means of the other two disability groups.

Within each age group women have right hemithoracic height means which increase as disability becomes more severe.

Table XVIIa. indicates which mean differences with reference to disability are significant, for men; Table XVII b. for women.

The absolute variability alters little by age or disability. The relative variability is moderate and is little influenced by age or disability. The values for men, particularly those for absolute variability are distinctly greater than the corresponding figures for women.

Tables XVIIIa. and XVIIIb. show the significance of the mean differences for the left and right vertical heights of hemithoraces for the non-emphysematous and emphysematous sub-groups of men derived from disability group III. In both age groups presented, the means of the emphysematous group are greater than the corresponding means of the non-emphysematous group, and the mean differences are highly significant ($P < 0.01$ for the four mean differences studied.)

TABLE XVII. VERTICAL DIAMETER OF RIGHT HEMITHORAX

The Means, Standard Deviations and Coefficients of Variation by sex, age and three grades of disability.

Age group	Disability group	No.	MEANS ± S.E (cms.)	S.D	C.V
MEN					
Under 40 years	I	30	23.8 ± 0.393	2.2	9.0
	II	9	23.3 ± 0.787	2.4	10.1
	III	9	26.7 ± 0.501	1.5	5.6
40 - 59 years	I	38	24.8 ± 0.393	2.4	9.8
	II	62	24.3 ± 0.343	2.7	11.1
	III	89	26.0 ± 0.219	2.1	8.0
60 years and more	I	10	24.9 ± 0.877	2.8	11.1
	II	35	24.0 ± 0.418	2.5	10.3
	III	82	26.2 ± 0.269	2.4	9.3
WOMEN					
Under 40 years	I	24	22.1 ± 0.319	1.6	7.1
	II	39	22.3 ± 0.255	1.6	7.1
	III	14	22.6 ± 0.455	1.7	7.4
40 - 59 years	I	11	22.0 ± 0.708	2.3	10.7
	II	37	22.3 ± 0.379	2.3	10.4
	III	37	22.5 ± 0.292	1.8	7.9
60 years and more	I	2	20.2		
	II	14	20.0 ± 0.518	1.9	9.7
	III	24	21.7 ± 0.441	2.2	10.0

TABLE XVII a. VERTICAL DIAMETER OF RIGHT HEMITHORAX

The Means, Mean Differences, t Values and Probabilities for disability groups I, II and III in various combinations for men in three age groups.

MEN

Age group	MEANS (cms.) for disability groups			MEAN DIFFERENCES ± S.E (cms.)	t	df	P
	I	II	III				
Under 40 years	23.8	23.3		- 0.54 ± 0.836	0.64	37	> .50
		23.3	26.7	+ 3.40 ± 0.933	3.65	16	<0.01
	23.8		26.7	+ 2.86 ± 0.772	3.70	37	<0.01
	23.7		26.7	+ 2.89 ± 0.770	3.88	46	<0.01
	(30)	(9)	(9)				
40 - 59 years	24.8	24.3		- 0.53 ± 0.535	0.99	98	>.30
		24.3	26.0	+ 1.73 ± 0.388	4.45	149	<0.01
	24.8		26.0	+ 1.10 ± 0.423	2.61	125	<0.01
	24.5		26.0	+ 1.52 ± 0.785	1.94	187	>0.05
	(38)	(62)	(89)				
60 years and more	24.9	23.9		- 0.92 ± 0.910	1.02	43	>.30
		23.9	26.2	+ 2.21 ± 0.494	4.48	115	<0.01
	24.9		26.2	+ 1.29 ± 0.827	1.55	90	>.10
	24.2		26.2	+ 2.00 ± 0.458	4.37	125	<0.01
	(10)	(35)	(82)				

(In bracket below each mean is the number of individuals in group).

TABLE XVII b. VERTICAL DIAMETER OF RIGHT HEMITHORAX

The Means, Mean Differences, t Values and Probabilities for disability groups I, II and III for women in three age groups.

WOMEN

Age group	MEANS (cms.) for disability groups I	II	III	MEAN DIFFERENCES ± S.E (cms.)	t	df	P
Under 40 years	22.1	22.3		+ 0.18 ± 0.410	0.44	61	>.60
		22.3	22.6	+ 0.31 ± 0.502	0.62	51	>.50
	22.1		22.6	+ 0.49 ± 0.538	0.91	36	>.30
	(24)	(39)	(14)				
40 - 59 years	22.0	22.3		+ 0.24 ± 0.795	0.30	46	>.70
		22.3	22.5	+ 0.23 ± 0.478	0.48	72	>.60
	22.0		22.5	+ 0.47 ± 0.657	0.72	46	>.40
	(11)	(37)	(37)				
60 years and more		20.0	21.7	+ 1.72 ± 0.700	2.46	36	<0.02
	20.0		21.7	+ 1.70 ± 0.664	2.56	38	<0.02
	(2)	(14)	(24)				

(In bracket below each mean is the number of individuals in group).

TABLE XVIII a. VERTICAL CHEST DIAMETER OF LEFT HEMITHORAX

The Means, Mean Differences, t Values and Probabilities for the two sub-groups formed from disability group III for men, namely

A. Those individuals without emphysema and B. Those with emphysema.

MEN

Age group (years)	MEANS (cms.) for		MEAN DIFFERENCES ± S.E (cms.)	t	df	P
	Subgroup A	Subgroup B				
Under 60	25.3	27.2	+ 1.89 ± 0.372	5.09	96	<0.01
	(58)	(40)				
60 and more	25.3	27.1	+ 1.75 ± 0.506	3.46	80	<0.01
	(44)	(38)				

TABLE XVIII b. VERTICAL CHEST DIAMETER OF RIGHT HEMITHORAX

The corresponding values for the same sub-groups as above.

Age group (years)	MEANS (Cms.) for		MEAN DIFFERENCES ± S.E (cms.)	t	df	P
	Subgroup A	Subgroup B				
Under 60	26.1	28.0	+ 1.87 ± 0.352	5.30	96	<0.01
	(58)	(40)				
60 and more	26.3	28.3	+ 2.03 ± 0.503	4.04	80	<0.01
	(44)	(38)				

(In bracket below each mean is the number of individuals in group)

RESPIRATORY DIFFERENCE IN HEMITHORACIC VERTICAL HEIGHT

Table XIX a. shows the means, standard deviations, and coefficients of variation of the "respiratory difference" in vertical height of left hemithorax by sex, age and disability.

The average respiratory difference in left hemithoracic vertical diameter diminished with increasing disability in each age group; but the effect of age within each disability group shows no uniform trend. This applies for each sex though the range of variation of mean respiratory difference is less for women, and in general each value is less than the corresponding value for men. For example, in the intermediate age group the respiratory difference mean declines for men from 5.2 cm. in disability group I through 4.3 cm. in disability group II to 3.3 cm. in disability group III, and the corresponding values for women are 4.8 cm., 4.2 cm. and 3.4 cm.

Table XIX b. gives the means, standard deviations and coefficients of variation of the respiratory difference in vertical height of right hemithorax by age, sex and disability. The observations on the right side of the chest closely parallel those recorded above. For each sex no consistent influence of age can be traced, but for both sexes increasing disability in each age group is associated with falling mean values of respiratory range of right hemithoracic height. For example, for men in the middle age group a decline is recorded from 5.0 cm. in disability group I to 3.0 cm. in disability group III, the corresponding values for women being 4.4 cm. in disability group I to 2.9 cm. in disability group III.

Table XX a. and XX b. present analyses of the t tests contrasting the above "respiratory difference" means. In Table XX a. the mean differences in respiratory range of left hemithoracic vertical height reach statistical levels of significance in all three age groups. The mean respiratory difference in hemithoracic height on the left side is less in disability group II than in disability group I. Similarly, it is less in disability group III than in disability group II.

Table XX b. assesses the mean differences for the right hemithorax. Statistical significance is demonstrated in all age groups. Despite the few exceptions which show no significance on contrasting different disability groups the general trend is uniform throughout each age group, for each side of chest and for each sex.

Table XXI presents the contrast between the subgroups of disability group III for men having obvious emphysema (B) and without obvious emphysema (A). The mean differences show a high level of statistical significance. There is a reduction of respiratory difference in hemithoracic vertical height with emphysema indicated by negative signs throughout. On each side of the chest both above and below the age of sixty, the probability of this being due to chance is in each case less than 0.01.

TABLE XIX a.

RESPIRATORY DIFFERENCE IN VERTICAL CHEST DIAMETER, LEFT HEMITHORAX

The Means, Standard Deviations, and Coefficients of Variation by sex, age and three grades of disability.

Age group	Disability group	No.	MEANS ± S.E (cms.)	S.D	C.V
MEN					
Under 40 years	I	30	4.8 ± 0.281	1.5	32.4
	II	9	4.2 ± 0.341	1.0	24.2
	III	9	2.7 ± 0.196	0.6	21.5
40 - 59 years	I	38	5.2 ± 0.257	1.6	30.3
	II	62	4.3 ± 0.183	1.4	33.7
	III	89	3.3 ± 0.149	1.4	42.8
60 years and more	I	10	5.1 ± 0.494	1.6	30.6
	II	35	4.2 ± 0.250	1.5	35.3
	III	82	3.4 ± 0.130	1.2	35.0
WOMEN					
Under 40 years	I	24	4.2 ± 0.299	1.5	34.9
	II	39	3.3 ± 0.210	1.3	39.5
	III	14	3.3 ± 0.488	1.8	55.3
40 - 59 years	I	11	4.8 ± 0.460	1.5	31.9
	II	37	4.2 ± 0.221	1.3	32.1
	III	37	3.4 ± 0.231	1.4	41.4
60 years and more	I	2	5.3		
	II	14	4.3 ± 0.435	1.6	38.2
	III	24	3.1 ± 0.269	1.3	42.8

TABLE XIX b.

RESPIRATORY DIFFERENCE IN VERTICAL CHEST DIAMETER, RIGHT HEMITHORAX

The Means, Standard Deviations, and Coefficients of Variation by sex, age and three grades of disability.

Age group	Disability group	No.	MEANS ± S.E (cms.)	S.D	C.V
MEN					
Under 40 years	I	30	4.6 ± 0.272	1.5	32.3
	II	9	3.9 ± 0.370	1.1	28.2
	III	9	2.7 ± 0.313	0.9	34.4
40 - 59 years	I	38	5.0 ± 0.263	1.6	32.5
	II	62	4.0 ± 0.175	1.4	34.2
	III	89	3.0 ± 0.152	1.4	47.9
60 years and more	I	10	5.4 ± 0.358	1.1	21.1
	II	35	3.8 ± 0.313	1.9	49.3
	III	82	3.0 ± 0.138	1.3	41.5
WOMEN					
Under 40 years	I	24	4.1 ± 0.283	1.4	33.5
	II	39	3.2 ± 0.209	1.3	41.0
	III	14	3.1 ± 0.507	1.9	62.0
40 - 59 years	I	11	4.4 ± 0.480	1.6	36.5
	II	37	4.0 ± 0.209	1.3	31.7
	III	37	2.9 ± 0.191	1.2	40.3
60 years and more	I	2	4.2		
	II	14	4.1 ± 0.382	1.4	35.3
	III	24	2.9 ± 0.263	1.3	44.1

TABLE XX a. RESPIRATORY DIFFERENCE IN VERTICAL CHEST DIAMETER, LEFT

The Means, Mean Differences, t Values and Probabilities for disability groups I, II and III by sex in three age groups.

Age group	MEANS (cms.) for disability groups I	II	III	MEAN DIFFERENCES ± S.E (cms.)	t	df	P
MEN							
Under 40 years	4.7	4.2		- 0.53 ± 0.548	0.96	37	>.30
		4.2	2.7	- 1.48 ± 0.393	3.76	16	<0.01
	4.7		2.7	- 2.00 ± 0.528	3.79	37	<0.01
	4.6		2.7	- 1.88 ± 0.493	3.82	46	<0.01
	(30)	(9)	(9)				
40 - 59 years	5.2	4.3		- 0.97 ± 0.308	3.16	98	<0.01
		4.3	3.3	- 0.98 ± 0.234	4.17	149	<0.01
	(38)	(62)	(89)				
60 years and more	5.1	4.2		- 0.91 ± 0.536	1.7	43	>0.05
		4.2	3.4	- 0.82 ± 0.257	3.17	115	<0.01
	4.4		3.4	- 1.02 ± 0.244	4.18	125	<0.01
	(10)	(35)	(82)				
WOMEN							
Under 40 years	4.2	3.3		- 0.87 ± 0.356	2.44	61	<0.02
		3.3	3.3	- 0.03 ± 0.455	0.07	51	>.90
	4.2		3.3	- 0.90 ± 0.540	1.67	36	>0.05
	(24)	(39)	(14)				
40 - 59 years	4.8	4.2		- 0.61 ± 0.475	1.28	46	>.20
		4.2	3.4	- 0.79 ± 0.319	2.47	72	<0.02
	4.8		3.4	- 1.40 ± 0.492	2.85	46	<0.01
	(11)	(37)	(37)				
60 years and more		4.3	3.1	- 1.19 ± 0.484	2.46	36	<0.02
	4.4		3.1	- 1.32 ± 0.461	2.86	38	<0.01
	(2)	(14)	(24)				

(In bracket below each mean is the number of individuals in group).

TABLE XX b. RESPIRATORY DIFFERENCE IN VERTICAL CHEST DIAMETER, RIGHT

The Means, Mean Differences, t Values and Probabilities for disability groups I, II and III by sex in three age groups.

Age group	MEANS (cms.) for disability groups I	II	III	MEAN DIFFERENCES ± S.E (cms.)	t	df	P
MEN							
Under 40 years	4.6	3.9		- 0.67 ± 0.538	1.24	37	>.20
		3.9	2.7	- 1.21 ± 0.484	2.50	16	<0.05
	4.6		2.7	- 1.88 ± 0.527	3.57	37	<0.01
	4.5		2.7	- 1.73 ± 0.500	3.45	46	<0.01
	(30)	(9)	(9)				
40 - 59 years	5.0	4.0		- 0.96 ± 0.272	3.54	98	<0.01
		4.0	3.0	- 1.04 ± 0.233	4.47	149	<0.01
	(38)	(62)	(89)				
60 years and more	5.4	3.8		- 1.60 ± 0.619	2.59	43	<0.01
		3.8	3.0	- 0.73 ± 0.294	2.49	115	<0.02
	4.1		3.0	- 1.09 ± 0.275	3.96	125	<0.01
	(10)	(35)	(82)				
WOMEN							
Under 40 years	4.1	3.2		- 0.95 ± 0.330	2.88	61	<0.01
		3.2	3.1	- 0.12 ± 0.439	0.27	51	>.70
	4.1		3.1	- 1.07 ± 0.534	2.00	36	<0.05
	(24)	(39)	(14)				
40 - 59 years	4.4	4.0		- 0.35 ± 0.462	0.76	46	>.40
		4.0	2.9	- 1.13 ± 0.283	4.00	72	<0.01
	4.4		2.9	- 1.48 ± 0.435	3.40	46	<0.01
	(11)	(37)	(37)				
60 years and more		4.1	2.9	- 1.13 ± 0.451	2.51	36	<0.02
	4.1		2.9	- 1.14 ± 0.424	2.69	38	<0.01
	(2)	(14)	(24)				

(In bracket below each mean is the number of individuals in group)

TABLE XXI

RESPIRATORY DIFFERENCES IN HEMITHORACIC HEIGHT LEFT AND RIGHT

The Means, Mean Differences, t Values and Probabilities for the two sub-groups formed from disability group III for men, namely A. Those individuals without emphysema and B. Those with emphysema.

MEN

Age group (years)	MEANS (cms.) for Subgroup A	MEANS (cms.) for Subgroup B	MEAN DIFFERENCES ± S.E (cm.)	t	df	P
			Left Hemithorax			
Under 60	38.1 (58)	24.0 (40)	- 14.1 ± 2.405	5.84	96	<0.01
60 and more	37.9 (44)	28.9 (38)	- 9.0 ± 2.706	3.30	80	<0.01
			Right Hemithorax			
Under 60	34.7 (58)	22.3 (40)	- 12.4 ± 2.580	4.80	96	<0.01
60 and More	34.2 (44)	25.7 (38)	- 8.5 ± 2.622	3.26	80	<0.01

(In bracket below each mean is the number of individuals in group)

DIAPHRAGMATIC HEIGHT

Table XXII shows the means, standard deviations and coefficients of variation of the vertical height of left dome of diaphragm by sex, age and disability.

For women there is progressive decrease in average diaphragmatic height on the left side with increasing disability in each age group, while there is a less consistent diminution with age in each disability group. For men the mean height of left diaphragm in each age group changes little between disability groups I and II (an exception being the oldest age group). A marked decline in mean diaphragmatic height is observed in the most advanced disability group for each age group. No consistent trend with age is observed for men.

Table XXIII shows the means, standard deviations and coefficients of variation of the right diaphragmatic height by sex, age and disability.

For women the mean height of right diaphragm falls consistently with increase of disability in each age group. There is no specific association with age.

For men in each age group the average right diaphragmatic height has comparable values in disability groups I and II but is much less in disability group III. Disability group III alone shows a trend towards decrease in average height of right diaphragm with age, the decline being from 4.8 cm. in the youngest age group to 4.0 cm. in the oldest age group.

The vertical heights of left and right domes of diaphragm have absolute variabilities which are very small and relative variabilities which are markedly large. The values for women are slightly lower than those for men.

Table XXIV a. and XXIV b. assess the significance of these reductions in mean height of diaphragm with reference to increase in disability. With the left dome of diaphragm, the mean differences reach significance for men only in the intermediate age group contrasting disability groups II and III ($P < 0.01$), and also disability groups I and III ($P < 0.01$).

For women statistical significance can be inferred in the youngest age group between disability groups II and III ($P < 0.01$), and between disability groups I and III ($P < 0.01$); and similarly in the oldest age group contrasting combined disability groups I and II with disability group III ($P < 0.05$).

With the right dome of the diaphragm for men the mean differences attain statistical significance in the intermediate age group contrasting disability groups II and III ($P < 0.02$), and disability groups I and III ($P < 0.05$); and in the oldest age group contrasting disability groups I with III ($P < 0.05$) and disability groups II with III ($P < 0.01$). For women in all groups there are statistically significant mean differences.

Table XXV assesses the decline in diaphragmatic height accompanying emphysema when disability group III is subdivided into B. those with obvious emphysema and A. those without obvious emphysema, for men. Over the age of sixty the mean difference reaches a significant level in each side of the chest ($P < 0.05$), but in the younger ages the differences fail to do so.

TABLE XXII. HEIGHT OF LEFT DIAPHRAGM

The Means, Standard Deviations and Coefficients of Variation by sex, age and three disability groups.

Age group	Disability groups	No.	MEANS ± S.E (cm.)	S.D	C.V
MEN					
Under 40 years	I	30	4.0 ± 0.153	0.8	20.8
	II	9	3.9 ± 0.442	1.3	33.7
	III	9	3.6 ± 0.475	1.4	40.0
40 - 59 years	I	38	4.1 ± 0.133	0.8	19.9
	II	62	4.1 ± 0.149	1.2	28.5
	III	89	3.4 ± 0.121	1.1	33.1
60 years and more	I	10	3.2 ± 0.289	0.9	28.6
	II	35	3.9 ± 0.211	1.2	32.4
	III	82	3.5 ± 0.122	1.1	31.6
WOMEN					
Under 40 years	I	24	4.3 ± 0.170	0.8	19.2
	II	39	4.1 ± 0.124	0.8	19.1
	III	14	3.3 ± 0.295	1.1	34.0
40 - 59 years	I	11	3.7 ± 0.279	0.9	25.3
	II	37	3.4 ± 0.169	1.0	30.4
	III	37	3.2 ± 0.150	0.9	28.7
60 years and more	I	2	3.9		
	II	14	3.5 ± 0.226	0.9	24.3
	III	24	3.0 ± 0.126	0.6	20.5

TABLE XXIII. HEIGHT OF RIGHT DIAPHRAGM

The Means, Standard Deviations and Coefficients of Variation by sex, age and three disability groups.

Age group	Disability groups	No.	MEANS ± S.E (cm.)	S.D	C.V
MEN					
Under 40 years	I	30	5.1 ± 0.243	1.3	26.3
	II	9	5.2 ± 0.244	0.7	14.1
	III	9	4.8 ± 0.440	1.3	27.6
40 - 59 years	I	38	4.9 ± 0.225	1.4	28.2
	II	62	4.8 ± 0.118	0.9	19.2
	III	89	4.3 ± 0.149	1.4	32.6
60 years and more	I	10	5.1 ± 0.466	1.5	29.1
	II	35	5.2 ± 0.259	1.5	29.5
	III	82	4.0 ± 0.177	1.6	40.4
WOMEN					
Under 40 years	I	24	5.0 ± 0.167	0.8	16.4
	II	39	4.9 ± 0.145	0.9	18.4
	III	14	3.7 ± 0.404	1.5	40.4
40 - 59 years	I	11	4.7 ± 0.207	0.7	14.8
	II	37	4.3 ± 0.191	1.2	27.3
	III	37	4.0 ± 0.187	1.0	24.1
60 years and more	I	2	4.9		
	II	14	4.6 ± 0.367	1.4	30.1
	III	24	3.8 ± 0.201	1.0	25.9

TABLE XXIV a. VERTICAL HEIGHT OF LEFT DIAPHRAGM

The Means, Mean Differences, t Values and Probabilities for disability groups I, II and III by sex in three age groups.

Age group	MEANS (cm.) for disability groups I	II	III	MEAN DIFFERENCES $\pm$ S.E (cm.)	t	df	P
MEN							
Under 40 years	4.0	3.9		-0.06 ± 0.366	0.17	37	$>.80$
		3.9	3.6	-0.39 ± 0.649	0.60	16	$>.50$
	4.0		3.6	-0.45 ± 0.377	1.20	37	$>.20$
	3.99		3.6	-0.44 ± 0.388	1.12	46	$>.20$
	(30)	(9)	(9)				
40 - 59 years	4.1	4.1		-0.002 ± 0.217	0.01	98	$>.90$
		4.1	3.4	-0.68 ± 0.190	3.55	149	<0.01
	4.1		3.4	-0.68 ± 0.204	3.32	125	<0.01
	4.1		3.4	-0.68 ± 0.364	1.86	187	>0.05
	(38)	(62)	(89)				
60 years and more	3.2	3.9		$+0.66 \pm 0.426$	1.56	43	$>.10$
		3.9	3.5	-0.37 ± 0.232	1.60	115	$>.10$
	(10)	(35)	(82)				
WOMEN							
Under 40 years	4.3	4.1		-0.26 ± 0.207	1.26	61	$>.20$
		4.1	3.3	-0.82 ± 0.272	3.00	51	<0.01
	4.3		3.3	-1.08 ± 0.316	3.42	36	<0.01
	(24)	(39)	(14)				
40 - 59 years	3.7	3.4		-0.27 ± 0.345	0.78	46	$>.40$
		3.4	3.2	-0.19 ± 0.226	0.84	72	$>.40$
	3.7		3.2	-0.46 ± 0.315	1.46	46	$>.10$
	(11)	(37)	(37)				
60 years and more		3.5	3.0	-0.46 ± 0.238	1.93	36	>0.05
	3.5		3.0	-0.51 ± 0.225	2.27	38	<0.05
	(2)	(14)	(24)				

(In bracket below each mean is the number of individuals in group).

TABLE XXIV b. VERTICAL HEIGHT OF RIGHT DIAPHRAGM

The Means, Mean Differences, t Values and Probabilities for disability groups I, II and III by sex, and three age groups.

Age group	MEANS (cm.) for disability groups I	II	III	MEAN DIFFERENCES ± S.E (cm.)	t	df	P
MEN							
Under 40 years	5.1	5.2		+ 0.12 ± 0.467	0.25	37	>.80
		5.2	4.8	- 0.41 ± 0.503	0.82	16	>.40
	5.1		4.8	- 0.32 ± 0.456	0.71	46	>.40
	(30)	(9)	(9)				
40 - 59 years	4.9	4.8		- 0.07 ± 0.231	0.31	98	>.70
		4.8	4.3	- 0.52 ± 0.204	2.57	149	<0.02
	4.9		4.3	- 0.59 ± 0.271	2.19	125	<0.05
	4.9		4.3	- 0.55 ± 0.486	1.13	187	>.20
	(38)	(62)	(89)				
60 years and more	5.1	5.2		+ 0.13 ± 0.545	0.25	43	>.80
		5.2	4.0	- 1.22 ± 0.320	3.83	115	<0.01
	5.1		4.0	- 1.09 ± 0.533	2.05	90	<0.05
	5.2		4.0	- 1.19 ± 0.291	4.11	125	<0.01
	(10)	(35)	(82)				
WOMEN							
Under 40 years	5.0	4.9		- 0.08 ± 0.226	0.35	61	>.70
		4.9	3.7	- 1.17 ± 0.339	3.45	51	<0.01
	5.0		3.7	- 1.25 ± 0.376	3.32	36	<0.01
	(24)	(39)	(14)				
40 - 59 years	4.7	4.3		- 0.40 ± 0.370	1.08	46	>.20
		4.3	4.0	- 0.28 ± 0.247	1.13	72	>.20
	4.7		4.0	- 0.68 ± 0.311	2.19	46	<0.05
	(11)	(37)	(37)				
60 years and more		4.6	3.8	- 0.75 ± 0.384	1.95	36	>0.05
	4.6		3.8	- 0.78 ± 0.367	2.12	38	<0.05
	(2)	(14)	(24)				

(In bracket below each mean is the number of individuals in group)

TABLE XXV. HEIGHT OF LEFT AND RIGHT DIAPHRAGM

The Means, Mean Differences, t Values and Probabilities for disability sub-groups derived for men from disability group III, namely A. Those individuals without emphysema and B. Those with emphysema.

MEN

Age group (years)	MEANS (cm.) for Subgroup A.	MEANS (cm.) for Subgroup B.	MEAN DIFFERENCES ± S.E (cm.)	t	df	P
		1. Left diaphragm by two age groups				
Under 60	3.6 (58)	3.3 (40)	- 0.32 ± 0.237	1.36	96	>.10
60 and more	3.7 (44)	3.2 (38)	- 0.53 ± 0.238	2.24	80	<0.05
		2. Right diaphragm by two age groups				
Under 60	4.6 (58)	4.0 (40)	- 0.53 ± 0.283	1.88	96	>0.05
60 and more	4.3 (44)	3.6 (38)	- 0.71 ± 0.348	2.05	80	<0.05
		3. Left diaphragm in all ages				
	3.65 (102)	3.24 (78)	- 0.42 ± 0.168	2.49	178	<0.02
		4. Right diaphragm in all ages				
	4.46 (102)	3.82 (78)	- 0.64 ± 0.221	2.87	178	<0.01

(Below each mean in bracket is the number of individuals in group)

TRANSVERSE CHEST DIAMETER

Table XXVI shows the means, standard deviations and coefficients of variation of transverse chest diameter by sex, age and disability. In each age group the average transverse chest diameter varies little showing no recognisable trend with reference to disability. Furthermore, there is no consistent trend with age except for a fall in disability group I for men and in disability group III for women.

Table XXVI a. gives an assessment of the mean differences obtained when disability group III for men is sub-divided as before into B. those showing obvious emphysema and A. those without emphysema. Statistical significance is not demonstrated ($P > 0.05$). The means are consistently lower for women than for men.

The absolute and relative variabilities are exceedingly moderate with no material changes by age or by disability. The absolute variability is less for women than for men.

TABLE XXVI. TRANSVERSE CHEST DIAMETER

The Means, Standard Deviations and Coefficients of Variation by sex, age and three grades of disability.

Age group	Disability group	No.	MEANS ± S.E (cm.)	S.D	C.V
MEN					
Under 40 years	I	30	29.9 ± 0.264	1.4	4.8
	II	9	29.4 ± 0.712	2.1	7.3
	III	9	29.9 ± 0.480	1.4	4.8
40 - 59 years	I	38	29.6 ± 0.340	2.1	7.1
	II	62	29.5 ± 0.237	1.9	6.3
	III	89	29.2 ± 0.189	1.8	6.1
60 years and more	I	10	28.3 ± 0.228	1.8	6.5
	II	35	29.5 ± 0.337	2.0	6.8
	III	82	28.7 ± 0.228	2.1	7.2
WOMEN					
Under 40 years	I	24	26.4 ± 0.331	1.6	6.2
	II	39	25.6 ± 0.232	1.5	5.7
	III	14	25.6 ± 0.384	1.4	5.6
40 - 59 years	I	11	26.1 ± 0.540	1.8	6.9
	II	37	26.0 ± 0.276	1.7	6.5
	III	37	25.6 ± 0.250	1.5	5.9
60 years and more	I	2	26.6		
	II	14	25.2 ± 0.438	1.6	6.5
	III	24	24.8 ± 0.400	2.0	7.9

TABLE XXVI a. TRANSVERSE CHEST DIAMETER

The Means, Mean Differences, t Values and Probabilities for the sub-groups formed from disability group III for men, namely

A. Those individuals without gross emphysema, ...

B. Those individuals with emphysema.

MEN

All ages	MEANS (cm.) for		MEAN DIFFERENCES ± S.E (cm.)	t	df	P
	Subgroup A.	Subgroup B.				
	29.26 (102)	28.70 (78)	- 0.55 ± 0.287	1.92	178	>0.05

(Number of individuals in group appear below each mean in bracket)

TABLE XXVI b. TRANSVERSE DIAMETER OF CHEST

Analyses of Variance between sub-groups ob+ained from disability group III for men, namely A. Those indivi uals without emphysema, and

B. Those individua.. ith emphysema.

MEN

1. Age group under 60 years

Source of variation	Sum of squares	df	Mean square
Between groups	6.43	1	6.43
Within groups	293.46	96	3.06
Total	299.89	97	

Variance Ratio = 2.1

2. Age group 60 years and more

Source of variation	Sum of squares	df	Mean square
Between groups	5.11	1	5.11
Within groups	341.27	80	4.27
Total	346.38	81	

Variance Ratio = 1.2

In neither age group is the variation significant.

CHEST DEPTH

Table XXVII shows the means, standard deviations, and coefficients of variation of chest depth by sex, age and disability.

In each age group there is a small increase of average chest depth with increasing disability, except for men in the oldest age group and for women in the intermediate age group. Within disability groups there is a consistent increase in mean chest depth for both sexes with age. The means for women are all lower than those for men.

Table XXVIII gives an assessment of the significance of the mean difference in each age group by disability.

For men levels of statistical significance are not attained except in the youngest age group between disability groups I and III ($P < 0.02$).

For women, only in the youngest age group again is there significance in the mean difference of chest depth when contrasting disability groups II and III ($P < 0.05$), and disability groups I and III ($P < 0.01$).

The presence or absence of emphysema in the cases from disability group III for men sub-divided as before into B. those with obvious emphysema and A. those without obvious emphysema, gives an analysis of variance (Table XXIX) which fails to indicate any statistical differences in chest depth means in either the older or the younger age group.

The absolute and relative variabilities do not alter markedly by sex, age or disability.

The absolute values are small and the relative variabilities are moderate.

TABLE XXVII. CHEST DEPTH

The Means, Standard Deviations and Coefficients of Variation by sex, age and three grades of disability.

Age group	Disability groups	No.	MEANS ± S.E (cm.)	S.D	C.V
MEN					
Under 40 years	I	30	21.1 ± 0.340	1.9	8.8
	II	9	22.1 ± 0.701	2.1	9.5
	III	9	22.7 ± 0.610	1.8	8.1
40 - 59 years	I	38	22.3 ± 0.411	2.5	11.3
	II	62	22.7 ± 0.288	2.3	10.0
	III	89	23.0 ± 0.234	1.9	8.1
60 years and more	I	10	23.5 ± 0.685	2.2	9.2
	II	35	23.1 ± 0.346	2.0	8.9
	III	82	23.3 ± 0.209	1.9	8.1
WOMEN					
Under 40 years	I	24	18.5 ± 0.277	1.4	7.3
	II	39	19.0 ± 0.308	1.9	10.1
	III	14	20.4 ± 0.642	2.4	11.8
40 - 59 years	I	11	20.2 ± 0.648	2.2	10.6
	II	37	20.1 ± 0.246	1.5	7.5
	III	37	20.7 ± 0.303	1.9	8.9
60 years and more	I	2	20.7		
	II	14	20.3 ± 0.323	1.2	5.9
	III	24	21.2 ± 0.389	1.9	9.0

TABLE XXVIII. CHEST DEPTH

The Means, Mean Differences, t Values and Probabilities between disability groups I, II and III for each sex in three age groups.

Age group	MEANS (cm.) for disability groups			MEAN DIFFERENCES ± S.E (cm.)	t	df	P
MEN	I	II	III				
Under 40 years	21.1	22.1		+ 1.01 ± 0.728	1.38	37	>.10
		22.1	22.7	+ 0.66 ± 0.923	0.71	16	>.40
	21.1		22.7	+ 1.66 ± 0.705	2.36	37	<0.02
	21.3		22.7	+ 1.43 ± 0.710	2.01	46	<0.05
	21.1 (30)	22.4 (9)	(9)	+ 1.33 ± 0.564	2.36	46	<0.02
40 - 59 years	22.3	22.7		+ 0.39 ± 0.487	0.80	98	>.40
		22.7	23.0	+ 0.28 ± 0.369	0.75	149	>.40
	22.3		23.0	+ 0.67 ± 0.447	1.49	125	>.10
	22.3 (38)	22.9 (62)	(89)	+ 0.55 ± 0.416	1.33	187	>.10
60 years and more	23.5	23.1		- 0.38 ± 0.743	0.51	43	>.60
		23.1	23.3	+ 1.48 ± 0.392	0.38	115	>.70
	23.5		23.3	- 0.23 ± 0.644	0.36	90	>.70
	23.5 (10)	23.2 (35)	(82)	- 0.28 ± 0.643	0.43	125	>.60

(Below each mean in bracket is the number of individuals in group)

TABLE XXVIII CHEST DEPTH (CONTD.)

The Means, Mean Differences, t Values and Probabilities between disability groups I, II and III for women in three age groups.

Age group	MEANS (cm.) for disability groups			MEAN DIFFERENCES ± S.E (cm.)	t	df	P
WOMEN	I	II	III				
Under 40 years	18.5	19.0		+ 0.46 ± 0.449	1.02	61	>.30
		19.0	20.4	+ 1.48 ± 0.640	2.31	51	<0.05
	18.5 (24)	(39)	20.4 (14)	+ 1.94 ± 0.607	3.20	36	<0.01
40 years and more	20.2	20.1		- 0.10 ± 0.571	0.18	46	>.80
		20.1	20.7	+ 0.62 ± 0.391	1.59	72	>.10
	20.2 (11)	(37)	20.7 (37)	+ 0.52 ± 0.658	0.79	46	>.40
60 years and more		20.3	21.2	+ 0.81 ± 0.568	1.43	36	>.10
	20.4 (2)	(14)	21.2 (24)	+ 0.76 ± 0.542	1.40	38	>.10

(Below each mean in bracket is the number of individuals in group).

TABLE XXIX. CHEST DEPTH

Analyses of Variance between the sub-groups from disability group III for men, namely A. Those without gross emphysema, and
B. Those individuals with emphysema.

MEN

1. Age group under 60 years

Source of variation	Sum of squares	df	Mean square
Between groups	338	1	338
Within groups	45144	96	470.25
Total	45482	97	

Variance Ratio = 0.72

2. Age group 60 years and more

Source of variation	Sum of squares	df	Mean square
Between groups	8	1	8.0
Within groups	29038	80	362.975
Total	29046	81	

Variance Ratio = 0.022

In neither age group is the variation significant.

INTERCOSTAL DISTANCE

Table XXX shows the means, standard deviations and coefficients of variation of intercostal distance by sex, age and disability.

No consistent trends in average intercostal distance can be traced with reference either to age or to disability unless it be an uncertain increase within increased disability for each sex. Nevertheless the sex difference is plain to see.

Confirming there is no statistical variation are the tables of analyses of variance for men (Table XXX a.) and for women (Table XXX b.), except in the intermediate age group for men where significance is shown at 1% level.

When disability group III is sub-divided into A. those without emphysema and B. those with obvious emphysema for men, analyses of variance (Table XXXI) indicate there is no significant variation in mean intercostal distance in either of the main age groups below sixty years or sixty years and more.

Absolute variability is small and relative variability is moderate. They seem independent of age, sex and disability.

TABLE XXX. INTERCOSTAL DISTANCE

The Means, Standard Deviations, and Coefficients of Variation by sex, age and three grades of disability.

Age group	Disability group	No.	MEANS ± S.E (cm.)	S.D	C.V
MEN					
Under 40 years	I	30	2.6 ± 0.050	0.27	10.4
	II	9	2.7 ± 0.089	0.27	10.1
	III	9	2.7 ± 0.053	0.16	5.9
40 - 59 years	I	38	2.8 ± 0.065	0.40	14.6
	II	62	2.7 ± 0.034	0.27	10.1
	III	89	2.8 ± 0.032	0.30	10.5
60 years and more	I	10	2.7 ± 0.094	0.30	11.1
	II	35	2.8 ± 0.045	0.28	9.7
	III	82	2.7 ± 0.037	0.33	12.2
WOMEN					
Under 40 years	I	24	2.4 ± 0.047	0.23	9.7
	II	39	2.4 ± 0.041	0.26	10.5
	III	14	2.4 ± 0.068	0.25	10.4
40 - 59 years	I	11	2.3 ± 0.122	0.41	18.1
	II	37	2.4 ± 0.044	0.27	11.1
	III	37	2.4 ± 0.042	0.25	10.4
60 years and more	I	2	2.5		
	II	14	2.3 ± 0.057	0.21	9.2
	III	24	2.4 ± 0.056	0.28	11.6

TABLE XXX a. INTERCOSTAL DISTANCE

Analyses of Variance between disability groups I, II and III for men in three age groups.

MEN

1. Ages under 40 years

Source of variation	Sum of squares	df	Mean square
Between groups	5	2	2.5
Within groups	291	45	6.47
Total	296	47	

Variance Ratio = 0.39 The differences are not significant.

2. Age group 40 - 59 years

Source of variation	Sum of squares	df	Mean square
Between groups	97	2	48.5
Within groups	1825	186	8.812
Total	1922	188	

Variance Ratio = 4.94 Significant at the 1 % point of variance ratio.

3. Age group 60 years and more

Source of variation	Sum of squares	df	Mean square
Between groups	5	2	2.5
Within groups	1219	124	9.83
Total	1224	126	

Variance Ratio = 0.25 The differences are not significant.

In the intermediate age group

For $v_1 = 2$ and $v_2 = 186$, the 1 % point of the variance ratio is 4.60. Therefore the differences between the means of the three disability groups are significant.

TABLE XXX b. INTERCOSTAL DISTANCE

Analyses of Variance for women between disability groups I, II and III in three age groups.

WOMEN

1. Age group under 40 years

Source of variation	Sum of squares	df	Mean square
Between groups	0.03	2	.015
Within groups	4.56	74	.0616
Total	4.59	76	

Variance Ratio = 0.24

2. Age group 40 - 59 years

Source of variation	Sum of squares	df	Mean square
Between groups	0.29	2	0.145
Within groups	6.52	82	0.080
Total	6.81	84	

Variance Ratio = 1.81

3. Age group 60 years and more

Source of variation	Sum of squares	df	Mean square
Between groups	.04	2	.02
Within groups	2.34	37	0.63
Total	2.38	39	

Variance Ratio = 0.32

In none of the age groups is the variation significant.

TABLE XXXI. INTERCOSTAL DISTANCE

Analyses of Variance for men between sub-groups obtained from disability group III, namely A. Those individuals without emphysema, and

B. Those individuals with emphysema.

MEN

1. Age group under 60 years

Source of variation	Sum of squares	df	Mean square
Between groups	2	1	2.0
Within groups	812	96	8.46
Total	814	97	

Variance Ratio = 0.24

2. Age group 60 years and more

Source of variation	Sum of squares	df	Mean square
Between groups	13	1	13.0
Within groups	883	80	11.04
Total	896	81	

Variance Ratio = 1.18

In neither of the age groups is there significance.

COSTOVERTICAL ANGLE

Table XXXII gives the means, standard deviations, and coefficients of variation of the costovertical angle by sex, age and disability.

No distinct trend can be traced with reference to disability. For men, the average costovertical angle is reduced in the greatest degree of disability at all ages. For women there is a similar reduction except in the intermediate age group.

No trend with reference to age can be traced for men, but for women there is some evidence of increase in average costovertical angle in each disability group with age.

Analyses of variance discount any significance in mean differences between disability groups except in the oldest age group for men only. (Tables XXXII a. and XXXII b.). The ribs are more vertically placed in the severely disabled groups in both sexes.

The absolute and relative variabilities are moderate. Sex differences are not remarkable. Trends by age and disability are not noticeable.

Table XXXIII shows an assessment of the significance of differences in mean costovertical angle, contrasting the sub-groups A. without emphysema and B. with emphysema when disability group III for men is specially examined with reference to the presence or absence of gross emphysema. Levels of statistical significance are attained in the age group under sixty years, and also if all ages are summated.

In those with obvious emphysema there is an actual reduction in costovertical angle.

TABLE XXXII. COSTOVERTICAL ANGLE

The Means, Standard Deviations, and Coefficients of Variation by sex, age and disability groups.

Age group	Disability group	No.	MEANS ± S.E (degrees)	S.D	C.V
MEN					
Under 40 years	I	30	60.5 ± 1.422	7.8	12.9
	II	9	62.0 ± 1.795	5.4	8.7
	III	9	55.9 ± 1.760	5.3	9.5
40 - 59 years	I	38	59.4 ± 1.112	6.9	11.5
	II	62	60.6 ± 0.948	7.5	12.3
	III	89	58.5 ± 0.895	8.4	14.4
60 years and more	I	10	58.1 ± 4.197	13.3	2.3
	II	35	60.5 ± 1.625	9.6	15.9
	III	82	55.8 ± 0.410	3.7	6.7
WOMEN					
Under 40 years	I	24	58.0 ± 1.410	6.9	11.9
	II	39	57.4 ± 1.234	7.7	13.4
	III	14	57.0 ± 2.830	10.6	18.6
40 - 59 years	I	11	58.6 ± 1.671	5.5	9.5
	II	37	59.3 ± 1.462	8.9	15.0
	III	37	59.3 ± 1.452	8.8	14.9
60 years and more	I	2	66.0		
	II	14	65.0 ± 2.089	7.8	12.0
	III	24	59.5 ± 1.703	8.3	14.0

TABLE XXXII a. COSTOVERTICAL ANGLE

Analyses of Variance between disability groups I, II and III for men in three age groups.

MEN

1. Age group under 40 years

Source of variation	Sum of squares	df	Mean square
Between groups	195	2	97.5
Within groups	2213	45	49.178
Total	2408	47	

Variance Ratio = 1.98 The differences are not significant.

2. Age group 40 - 59 years

Source of variation	Sum of squares	df	Mean square
Between groups	151	2	75.5
Within groups	11404	186	61.312
Total	11555	188	

Variance Ratio = 1.23 The differences are not significant.

3. Age group 60 years and more

Source of variation	Sum of squares	df	Mean square
Between groups	539	2	269.5
Within groups	2001	124	16.137
Total	2540	126	

Variance Ratio = 16.7

In the oldest age group,

For $v_1 = 2$ and $v_2 = 124$, the 0.1 % point of the variance ratio is 6.91. Therefore the differences between the means of the three disability groups are highly significant.

TABLE XXXII b. COSTOVERTICAL ANGLE

Analyses of Variance between disability groups I, II and III for women in three age groups.

WOMEN

1. Age group under 40 years

Source of variation	Sum of squares	df	Mean square
Between groups	10	2	5
Within groups	4812	74	65.03
Total	4822	76	

Variance Ratio = 0.077

2. Age group 40 - 59 years

Source of variation	Sum of squares	df	Mean square
Between groups	4	2	2.0
Within groups	5965	82	72.74
Total	5969	84	

Variance Ratio = 0.027

3. Age group 60 years and more

Source of variation	Sum of squares	df	Mean square
Between groups	306	2	153
Within groups	2426	37	65.57
Total	2732	39	

Variance Ratio = 2.33

In none of the age groups is the variation significant.

TABLE XXXIII. COSTOVERTICAL ANGLE

The Means, Mean Differences, t Values and Probabilities for the sub-groups for men, formed from disability group III, namely A. Those individuals without emphysema, and B. Those with emphysema.

MEN

Age group (years)	MEANS (degrees) for Subgroup A	MEANS (degrees) for Subgroup B	MEAN DIFFERENCES ± S.E (degrees)	t	df	P
Under 60	59.6 (58)	56.4 (40)	- 3.30 ± 1.663	1.98	96	<0.05
60 and more	57.0 (44)	54.5 (38)	- 2.40 ± 2.060	1.17	80	$>.20$
All ages	58.5 (102)	55.5 (78)	- 3.02 ± 1.307	2.30	178	<0.05

(Below each mean is the number of individuals in the group, in bracket).

KYPHOTIC ANGLES

Table XXXIV gives the means, standard deviations, and coefficients of variation of kyphotic angle by sex, age and disability.

For both sexes there is a steady increase of mean kyphotic angle in each age group with increasing disability and in each disability group with increase of age. The range for men in the youngest age group is 25.9° to 38.6°; in intermediate ages it is 36.9° to 40.2° and in the oldest age group 42.9° to 46.9°. On the whole women are about 4° more kyphotic than men but their ranges are greater by that amount in both the intermediate and older age groups.

Table XXXV a. and XXXV b. give assessments for men and women of the significance of these differences in mean kyphotic angles. Statistical levels of significance are attained for men in the youngest age group, between disability groups I and III ($P < 0.01$), and between disability group I and groups II and III combined ($P < 0.01$); and in all age groups summated, between disability groups I and II ($P < 0.01$) and between II and III ($P < 0.02$).

For women significance is noted in youngest age group contrasting disability group II and III ($P < 0.01$) and groups I and III ($P < 0.01$); and in the intermediate age group contrasting disability groups I and III ($P < 0.05$).

TABLE XXXIV. KYPHOTIC ANGLE

The Means, Standard Deviations, and Coefficients of Variation by sex, age and three grades of disability.

Age Group	Disability group	No.	MEANS ± S.E (degrees)	S.D	C.V
MEN					
Under 40 years	I	30	25.9 ± 2.021	11.1	42.7
	II	9	33.7 ± 4.123	12.4	36.7
	III	9	38.6 ± 2.937	8.8	22.9
40 - 59 years	I	38	36.9 ± 2.398	14.8	40.1
	II	62	38.8 ± 1.670	13.1	33.9
	III	89	40.2 ± 0.981	9.3	23.0
60 years and more	I	10	42.9 ± 3.987	12.6	29.4
	II	35	43.0 ± 2.638	15.6	36.3
	III	82	46.9 ± 1.277	11.6	24.6
WOMEN					
Under 40 years	I	24	29.8 ± 2.338	11.5	38.4
	II	39	29.9 ± 1.996	12.5	41.7
	III	14	42.2 ± 4.137	15.5	36.7
40 - 59 years	I	11	35.9 ± 3.265	10.8	30.2
	II	37	39.1 ± 2.072	12.6	32.2
	III	37	44.1 ± 2.058	12.5	28.4
60 years and more	I	2	42.5		
	II	14	47.6 ± 1.967	7.4	15.4
	III	24	50.0 ± 1.887	9.2	18.5

TABLE XXXV a. KYPHOTIC ANGLE

The Means, Mean Differences, t Values and Probabilities for three disability groups I, II and III for Men in three age groups.

Age group	MEANS (degrees) for disability groups			MEAN DIFFERENCES ± S.E (degrees)	t	df	P
MEN	I	II	III				
Under 40 years	25.9	33.7		+ 7.76 ± 4.318	1.80	37	>0.05
		33.7	38.6	+ 4.89 ± 5.062	0.97	16	>.30
	25.9		38.6	+ 12.63 ± 4.036	3.13	37	<0.01
	25.9 (30)	36.1 (9)	(9)	+ 10.21 ± 3.262	3.13	46	<0.01
40 - 59 years	36.9	38.8		+ 1.97 ± 1.461	1.35	98	>.10
		38.8	40.2	+ 1.32 ± 2.731	0.48	149	>.60
	36.9		40.2	+ 3.29 ± 2.166	1.50	125	>.10
	36.9	39.6		+ 2.75 ± 2.150	1.28	187	>.20
	38.1 (38)	(62)	40.2 (89)	+ 2.07 ± 3.951	0.52	187	>.60
60 years and more	42.9	43.0		+ 0.10 ± 5.389	0.02	43	>.90
		43.0	46.9	+ 3.94 ± 2.626	1.50	115	>.10
	42.9		46.9	+ 4.04 ± 3.910	1.03	90	>.30
	43.0 (10)	(35)	46.9 (82)	+ 3.96 ± 2.378	1.67	125	>0.05
MEN							
All ages	33.4	39.8		+ 6.35 ± 2.125	2.99	182	<0.01
		39.8	43.2	+ 3.39 ± 1.387	2.45	284	<0.02

(Below each mean in bracket is the number of individuals in group)

TABLE XXXV b. KYPHOTIC ANGLE

The Means, Mean Differences, t Values and Probabilities for three disability groups I, II and III, for women in three age groups.

Age group	MEANS (degrees) for disability groups			MEAN DIFFERENCES $\pm$ S.E (degrees)	t	df	P
WOMEN	I	II	III				
Under 40 years	29.8	29.9		+ 0.10 $\pm$ 3.135	0.03	61	$>.90$
		29.9	42.2	+ 12.31 $\pm$ 4.142	2.97	51	<0.01
	29.8		42.2	+ 12.41 $\pm$ 4.388	2.83	36	<0.01
	(24)	(39)	(14)				
40 - 59 years	35.9	39.1		+ 3.24 $\pm$ 4.203	0.77	46	$>.40$
		39.1	44.1	+ 5.00 $\pm$ 2.918	1.72	72	>0.05
	35.9		44.1	+ 8.24 $\pm$ 4.148	1.99	46	<0.05
	(11)	(37)	(37)				
60 years and more		47.6	50.0	+ 2.32 $\pm$ 3.394	0.68	36	$>.40$
	47.0		50.0	+ 2.96 $\pm$ 2.719	1.09	38	$>.20$
	(2)	(14)	(24)				

(Below each mean in bracket is the number of individuals in group).

TRANSVERSE HEART DIAMETER

Table XXXVI shows the means, standard deviations, and coefficients of variation of transverse diameter of heart by sex, age and disability. For men, there is a trend towards increase of average transverse heart diameter with increasing age when each disability group is taken individually. For women the increase is more distinct, for example in disability group III the mean transverse diameter of heart increases from 11.3 cm. in youngest age group to 12.8 cm. in the oldest age group.

However, within age groups the effect of disability increase is less straightforward. For men, the mean transverse heart diameter seems greater in disability group II than in group I, whereas in disability group III it is more distinctly reduced compared with either disability groups I or II. For women, this trend is present in the intermediate age group; however, in the youngest and oldest age groups the means for disability group III are greater than the corresponding means for group II. Overall, the means for women are lower than for men except in the extremes of age and disability.

The absolute variability is small and the relative variability very moderate. Neither shows any trend with reference to age or disability. The values for women may be a little lower than for men.

Table XXXVI a. assesses the significance of mean differences in transverse heart diameter in two age groups between the sub-groups formed when disability group III for men is sub-divided into A. those without obvious emphysema and B. those with obvious emphysema. Statistical significance is indicated both in ages under sixty years ($P < 0.02$), and also sixty years and over ($P < 0.02$).

A reduction in transverse heart diameter is linked with the presence of emphysema.

TABLE XXXVI. TRANSVERSE HEART DIAMETER

The Means, Standard Deviations, and Coefficients of Variation by sex, age and three grades of disability.

Age group	Disability group	No.	MEANS ± S.E (cm.)	S.D	C.V
MEN					
Under 40 years	I	30	12.6 ± 0.206	1.1	8.9
	II	9	12.9 ± 0.466	1.4	10.9
	III	9	11.5 ± 0.433	1.3	11.3
40 - 59 years	I	38	12.6 ± 0.195	1.2	9.5
	II	62	13.0 ± 0.214	1.7	12.9
	III	89	12.3 ± 0.154	1.5	11.8
60 years and more	I	10	12.7 ± 0.395	1.2	9.8
	II	35	13.2 ± 0.244	1.4	10.9
	III	82	12.3 ± 0.138	1.3	10.2
WOMEN					
Under 40 years	I	24	11.1 ± 0.226	1.1	10.0
	II	39	11.1 ± 0.180	1.1	10.1
	III	14	11.3 ± 0.305	1.1	10.1
40 - 59 years	I	11	11.6 ± 0.398	1.3	11.4
	II	37	11.8 ± 0.198	1.2	10.3
	III	37	11.5 ± 0.157	1.0	8.3
60 years and more	I	2	14.0		
	II	14	12.5 ± 0.271	1.0	8.1
	III	24	12.8 ± 0.370	1.8	14.2

TABLE XXXVI a. TRANSVERSE HEART DIAMETER

The Means, Mean Differences, t Values and Probabilities for the sub-groups formed from disability group III for men, namely A. Those individuals without emphysema, and B. Those with emphysema.

MEN

Age group (years)	MEANS (cm.) for Subgroup A.	Subgroup B.	MEAN DIFFERENCES ± S.E (cm.)	t	df	P
Under 60	12.5 (58)	11.8 (40)	- 0.70 ± 0.291	2.4	96	<0.02
60 and more	12.6 (44)	11.9 (38)	- 0.64 ± 0.269	2.4	80	<0.02

(Below each mean in bracket is the number of individuals in group)

HEART DEPTH

Table XXXVII shows the means, standard deviations, and coefficients of variation of heart depth by sex, age and disability.

For each sex the average heart depth when considered in the separate disability groups, shows an increase with age, although the amounts of increase are slight. On the other hand, it is difficult to trace any specific change with increase of disability when each age group is considered separately. For women there is some slight increase, for men the mean heart depth in disability group II is greater than in disability group I and in disability group III the lowest value of all is found. The means for women are in general lower than for men.

The absolute and relative variabilities are moderate and show no specific trend with reference to age or to disability. However, the values for women are lower than those for men.

Table XXXVII a. shows the significance of the mean differences in heart depth in relation to presence or absence of overt emphysema when the disability group III for men is sub-divided. Statistical significance is seen in the age group under sixty years ($P < 0.01$), and also in all age groups summated ($P < 0.01$).

A reduction in heart depth is linked with the presence of emphysema.

TABLE XXXVII. HEART DEPTH

The Means, Standard Deviations, and Coefficients of Variation by sex, age and three grades of disability.

Age group	Disability group	No.	MEANS ± S.E (cm.)	S.D	C.V
MEN					
Under 40 years	I	30	10.4 ± 0.204	1.1	10.8
	II	9	10.8 ± 0.326	1.0	9.0
	III	9	10.6 ± 0.529	1.6	14.9
40 - 59 years	I	38	10.9 ± 0.215	1.3	12.2
	II	62	10.9 ± 0.237	1.9	17.1
	III	89	10.8 ± 0.132	1.2	11.6
60 years and more	I	10	11.0 ± 0.183	0.6	5.3
	II	35	11.1 ± 0.190	1.1	10.1
	III	82	10.8 ± 0.131	1.2	11.0
WOMEN					
Under 40 years	I	24	9.3 ± 0.153	0.8	8.1
	II	39	9.4 ± 0.110	0.7	7.9
	III	14	9.8 ± 0.386	1.4	14.7
40 - 59 years	I	11	9.9 ± 0.260	0.9	8.7
	II	37	9.9 ± 0.169	1.0	10.4
	III	37	9.9 ± 0.162	1.0	10.0
60 years and more	I	2	11.1		
	II	14	10.6 ± 0.195	0.7	6.9
	III	24	10.7 ± 0.234	1.2	10.8

TABLE XXXVII a. HEART DEPTH

The Means, Mean Differences, t Values and Probabilities for the sub-groups formed from disability group III for men, namely A. Those individuals without emphysema, and B. those with emphysema.

MEN

Age group (years)	MEANS (cm.) for Subgroup A.	Subgroup B.	MEAN DIFFERENCES ± S.E (cm.)	t	df	P
Under 60	11.0 (58)	10.4 (40)	- 0.66 ± 0.161	4.13	96	<0.01
60 and more	10.9 (44)	10.6 (38)	- 0.39 ± 0.260	1.50	80	$>.10$
All ages	11.0 (102)	10.45 (78)	- 0.54 ± 0.147	3.64	178	<0.01

(Below each mean in bracket appears the number of individuals in group)

DISCUSSION

PHYSICAL ATTRIBUTES

Height and body weight are later to be correlated with Peak Flow rate. It is important to confirm age influences and distinguish these from associations for disability in each sex.

Disability is associated with reduction in height for each sex although significance is not demonstrated throughout, yet the reduction is more consistent for women than for men since for the latter the mean heights for disability groups II and III are comparable. The influence of age is less consistent although perhaps for men there is a diminution of height with advancing age. Since there can be no doubt that individuals do lose height with advancing years there may seem to be two possible explanations. Either more severely disabled shorter people die younger leaving relatively taller individuals or more taller individuals develop bronchitis later in life. Speculation of this kind without further information is unfruitful.

Disability is associated with a decline in body weight for men, and significance has been demonstrated. A close relation between emphysema and reduction in weight in all age groups for men from disability group III no doubt bears on this but seems unlikely to account for the whole effect. For men no association between age and body weight can be traced. The converse is the case for women, a positive association between increasing age and weight being demonstrated but no significant trend with relation to disability. The explanation for this does not seem to lie in a material difference in severity of disability in the two sexes, many women being just as severely disabled as the worst of the men.

Changes related to age found in general populations may be expected not to be reflected in detail in such a special group as this. Nevertheless, in regard to both systolic and diastolic blood pressures there is an increase for each sex with age, marked in systolic blood pressure but not significant in diastolic blood pressure. Whereas with disability for men no associated changes in systolic or diastolic blood pressure are apparent, for women in each case there is a consistent increase although no significance can be attributed.

Howell (1951) finds the blood pressure liable to considerable variation in the chronic bronchitic, falling with exacerbations and varying with age. Quoting the opinion of others the blood pressure is variously stated as low, normal, depending more on the age group, the diastolic pressure is low, but in his own series he does not record the diastolic pressure.

Of 114 individuals reported by Stuart-Harris and Hanley (1957) 25 have elevated blood pressure (diastolic of more than 90 mm. Hg.), but 20 of these are 50 years or more. The explanation is thought to be the normal age influence and not any relation between hypertension and pulmonary disease. In the present series the blood pressure levels are generally higher, the mean diastolic pressure being 90 mm. of mercury or more, in all groups aged 40 years and more, except for women in disability group I aged 40 to 59 years. The trends traced in this series do suggest that the influence of age far outweighs that of disability, nor is there any appreciable fall below normal levels in any group.

BODY SURFACE MEASUREMENTS

The coefficients of variation of chest girth (maximum), although ranging widely, are largely below the 7.7 level associated with the skeletal characteristics; those of chest girth (diaphragm) are somewhat higher, but on the whole lie below the 10.0 level. This indicates moderate variability with a reasonable degree of accuracy in assessing the chest.

No relation between disability and chest girth at either level for either sex has been traced, with the one exception of a fall of mean chest girth in disability group III for men only, but significance is only demonstrable in one age group namely the oldest. Emphysema on the other hand is related to a significant reduction in mean chest girth at both levels in men from disability group III. The two observations presumably are linked owing to the occurrence of emphysema in group III. An increase of chest girth with age for women shows no significance, but for men there is no corresponding increase. It seems likely this observation ties up with body weight increase for women with age.

A significant negative correlation between age and chest expansion has been reported by Cowan (1956) in older years. In this series at maximum level there is a diminution with age for each sex, but more marked for women, and at diaphragm level it is less consistent being found only in disability group I for men and also for women. A diminution in mean chest expansion with disability is demonstrated for each sex at both chest levels, significance being attributable except for women at the upper level and in all but the oldest age groups, although the means for

for disability groups II and III are relatively close. There is a marked difference between the means for the two sexes, most distinct in the oldest age group and greatest disability.

The range of values is wider for diaphragmatic chest expansion than at maximum level, not only between sexes but between age groups and with disability. This suggests the lower measurement being more dependent on diaphragm mobility than rib movement may reflect, changes in the mode of respiration between sexes, age groups, and severity of disability.

X-RAY MEASUREMENTS

According to Tirman and Hamilton (1952) the vertical height of hemithorax increases with age, significance for this observation being greater when calculated as a ratio of sitting height, and the vertical height of diaphragm diminishes with age, significantly in the fifth and sixth decades. In this series, no consistent trend with age is noted for either sex in regard to right or left hemithoracic vertical height. The coefficients of variation are on the whole very moderate. For women there is an increase of mean hemithoracic height with disability, for men although the means for disability groups I and II approximate, in passing to group III the hemithoracic height undergoes a distinct increase. Significande can be traced between groups II and III in the majority of groups. Emphysema is associated with a significant increase of hemithoracic height on each side in both age groups for men from disability group III. The presence of emphysema in group III particularly seems to account for the similarity of disability groups I and II and the dissimilarity of group III when considering hemithoracic height.

Diaphragmatic height in this series shows no specific trend with age except for men in disability group III only where there is a reduction with age increase. Simon and Galbraith (1953) use "low flat diaphragms" as one of their four criteria of emphysema, and these correlate with grades of dyspnoea. Other workers have demonstrated lowering and flattening of diaphragms (Whitfield et al. 1951).

Statements about reduction in height of diaphragm may be expected to imply increase in thoracic height. It will be noted that a distinction has been drawn in the present assessments rather than make any such assumption. In this series a consistent diminution of diaphragmatic height for women is found with disability in each age group; for men the mean diaphragmatic height in disability groups I and II are comparable but that of group III is distinctly reduced. Significance is not found in all groups except in all ages on the right side for women, but in more instances for both sexes is there significance on the right or the left. Among the men of disability group III there is a significant fall of diaphragmatic height on each side with emphysema in all age groups combined, and also in the over 60 years ages alone. The affinity of disability group II for group I rather than for group III may again be traced to a relative lack of emphysema cases.

RESPIRATORY DIFFERENCE IN VERTICAL CHEST DIAMETER

Whitfield et al. (1951) use fluoroscopy to demonstrate reduced movement of the diaphragm, but Knott and Christie (1951) doubt the value of this sign. Sinclair (1955) finds the maximum diaphragmatic excursion correlates with dyspnoea grade, the greatest dyspnoea tallying with greatest reduction in movement. Simon (1958) has found reductions from the normal 5 to 10 cm. to perhaps 2 cm. and other workers confirm the value of the sign (Stuart-Harris 1957). In this series the influence of age is not uniform but a significant association between disability due to bronchitis and reduced respiratory excursion has been demonstrated for both sexes on each side in all age groups (although the reductions for women are smaller indeed all values are smaller for women than for men).

There is also a significant reduction in respiratory excursion for men with emphysema within disability group III in each age group in each side of the chest.

It is notable that whereas the coefficients of variation for this attribute are much in excess of the 7.7 level, there is a remarkable consistency with regard to significance for the change in expiratory excursion between all disability groups in each side of the chest for each sex in all age groups.

Transverse Chest Diameter and Chest Depth

Tirman and Hamilton (1952) find no change in Transverse Chest Diameter with age but a progressive increase in Maximum Chest Depth with age (more significant if reckoned as a ratio of sitting height). This series has demonstrated a similar state of affairs, transverse chest diameter varying neither with age nor disability for either sex, nor yet with emphysema in disability group III for men. Cowan (1959) finds maximum transverse chest diameter stationary for men in older years but records a significant negative correlation between age and transverse chest diameter for women and postulates a relation between this finding and a corresponding increase of kyphosis with age for women. In this series the mean chest depth increases with age for each sex in each disability group, but a small increase with disability occurring in all except the oldest aged men and the intermediate age group for women, is only significant in the youngest age groups for each sex. The relation of chest depth to emphysema is not clear from this study.

Intercostal Distance and Costovertical Angle

The tendency for the ribs to be held up and forwards in emphysema has often been noted, expressed by Sparks and Wood (1932) as increased intercostal spaces and more horizontal ribs. In this series no consistent or significant alteration in distance between ribs has been demonstrated for either sex, except in the intermediate age group for men.

Nor has the intercostal distance altered significantly with emphysema among the men of disability group III.

Far from confirming the horizontal attitude of the ribs in emphysema the men of disability group III, seem to disprove the statement, a significant reduction of the costovertical angle being demonstrated in all ages combined and also in the older age group alone. The angle is increased giving a more horizontal attitude with age in all disability groups for women but for men age cannot be shown to exert an influence, except in the oldest age group. In this series, disability is associated with an inconstant reduction of the angle for men in all ages in the greatest disability, and for women except in intermediate age groups. No adequate reason for this discrepancy is forthcoming, but it is of interest that the more vertically placed ribs are occurring in disability group III for men in the general comparison and again they appear in those from disability group III with emphysema.

Kyphotic Angle

It is tempting to think that barrelling will necessarily be accompanied by some degree of kyphosis and hence kyphosis will be linked with disability. In this series for both sexes there is a steady increase of kyphotic angle with disability and also with age, women being more kyphotic than men by about 4°, the range for women also being wider by that amount than for men. Significance has been demonstrated in a number of comparisons. The shape of the chest varies so much among the presumed normal population that several workers have given the opinion that the chest contour is relatively unimportant (Simon and Galbraith 1953) (Knott and Christie 1951). It may be that kyphosis materially alters the relevance of rib attitude and overshadows the trend to horizontal placing.

Transverse Heart Diameter and Heart Depth

Tirman and Hamilton (1952) find an increase in transverse heart diameter only in the eighth decade, whereas Cowan (1958) with a greater number of men and women in the older ages finds no correlation with age for women in regard to transverse heart diameter but for men the association with age is positive and significant. In this series also, for each sex there is an increase in transverse heart diameter and heart depth with age.

A significant reduction in each heart measure is demonstrated with emphysema among the men of disability group III, and in the general comparisons disability group III shows a lower mean, although the mean for group II is higher than for group I for men. For women there is a tendency for the heart to be increased in each dimension with disability. This must be a complex situation when it is considered that among the grossly disabled will feature not only many obvious cases of emphysema but a distinct number who exhibit the signs of cor pulmonale with pulmonary artery prominence and eventually widening of the heart outline.

CORRELATION OF VENTILATORY CAPACITY WITH PHYSICAL VARIABLES

In this section, measurements of disability namely the highest readings obtained with the Peak Flowmeter, are presented for 569 patients made up of 367 men and 202 women between the ages of 17 and 82 years, and 17 and 75 years respectively. In addition to age and body weight, other data are correlated which have been obtained by direct measurement of the chest radiographs, namely the respiratory difference in vertical chest diameter (left hemithorax) and the kyphotic angle.

The object is to determine the nature and intensity of the relationship which exists between peak expiratory flow rate and these other attributes and thereby to assess the efficiency with which this value can be predicted from a knowledge of such variables.

The zero order coefficient of correlation for each pair of variables has been calculated for each sex. The closest relationships between peak flow rate and other variables are those involving age, respiratory difference in vertical chest diameter, and kyphotic angle. The associations between peak flow rate and height, or mean chest girth, while positive for both sexes in the case of height, do not attain statistical significance. (Tables II and I).

These coefficients of correlation do not take into account the interrelationships which exist between the variables themselves in differing degree. Consequently they do not measure the strength of association between the peak flow rate and each variable in turn when the influence of all the remaining independent variables is eliminated.

This is determined by the coefficients of partial correlation between peak flow rate and each variable separately, one or more of the others being held constant.

The third order Correlation Coefficients indicate that when any three independent variables are held constant, in men the significance of correlations between peak flow rate and each remaining independent variable is diminished. (Table III). Age and respiratory difference in vertical chest diameter remain the most important correlatives, the correlation with body weight and kyphotic angle being diminished beyond a significant level.

In women the significance of correlation with age though diminished, is still the most important; and that of peak flow rate with respiratory difference in vertical chest diameter is actually enhanced. The initial negative and insignificant relationship of peak flow rate and body weight becomes positive and significant when the remaining variables are held constant.

Next the relative strength of association between peak flow rate and various combinations of the independent variables are indicated by comparison of the Coefficients of Multiple Correlation (Table IV). In the case of men, R 1.23 is little less than the corresponding coefficients involving all the four variables. That is for men, the coefficient of multiple correlation involving age and respiratory difference in vertical chest diameter, is almost as high as when all variables are included. In women it can equally be stated that R 1.234 is little less than R 1.2345 and that accordingly for women, the coefficient of multiple correlation involving age, respiratory difference in vertical chest diameter, and body weight is almost as high as when all variables are included.

Equations predicting peak flow rate in terms of age and respiratory difference in vertical chest diameter in men (and in terms of age, respiratory difference and body weight in women) are therefore quite as efficient as those using all four variables, and are stated on the next page.

PREDICTION EQUATIONS

MEN $$X_1 = -4.3133\, X_2 + 35.1825\, X_3 + 453.3574$$

WOMEN $$X_1 = -3.3072\, X_2 + 18.3637\, X_3 + 1.0010\, X_4 + 224.7819$$

where X_1 is Peak Flowrate in litres per minute,

X_2 is age in completed years,

X_3 is respiratory difference in vertical height of left hemithorax (in cm.)

and X_4 is body weight in pounds.

The predictive efficiency of these equations is 20.2% for men, and 17.9% for women.

Equations using all four independent variables are stated as follows for completeness:

MEN: $$X_1 = -3.9288\, X_2 + 33.2635\, X_3 + 0.6809\, X_4 - 0.6991\, X_5 + 580.1985$$

WOMEN: $$X_1 = -2.7767\, X_2 + 17.9754\, X_3 + 0.9840\, X_4 - 1.1256\, X_5 + 247.6376$$

where the X_1 X_2 X_3 have the same uses as before and

X_4 is body weight in pounds, and

X_5 is kyphotic angle in degrees.

The Beta Coefficients are presented in Table V, and from these the relative influence of each independent variable on estimations of the Peak Flowrate can be inferred. For each sex the proportion is as follows:

	AGE	RES.DIF.	WT	K.ANGLE
MEN	- .34 :	+ .40 :	+ .12 :	- .07
WOMEN	- .43 :	+ .28 :	+ .25 :	- .16

It is to be noted that the sign in each case is the same in the two sexes.

TABLE I. COEFFICIENTS OF CORRELATION

	M E N	WOMEN
PFR. Height	+ .1550	+ .2933
PFR. Max. Chest Girth	- .0510	- .1562

TABLE II. COEFFICIENTS OF CORRELATION

	M E N	WOMEN
12	- .4376	- .4288
13	+ .4743	+ .3085
23	- .1479	- .0035
14	+ .2164	- .0512
24	+ .0463	+ .3541
34	+ .2591	+ .3010
15	- .2586	- .3570
25	+ .5898	+ .5001
35	+ .0614	- .0543
45	- .0706	+ .1413

The subscripts used in these tables and the following are:

1. Peak Flow Rate
2. Age
3. Respiratory difference in Vertical Chest Diameter
4. Body Weight
5. Kyphotic Angle

TABLE III CORRELATION AND PARTIAL CORRELATION COEFFICIENTS

		Correlation coefficient	Partial Correlation coefficient	
MEN	12	- .4376	12.345	- .3193
	13	+ .4743	13.245	+ .4243
	14	+ .2164	14.235	+ .1470
	15	- .2586	15.234	- .0715
WOMEN	12	- .4288	12.345	- .3993
	13	+ .3085	13.245	+ .3186
	14	- .0512	14.235	+ .2569
	15	- .3570	15.234	- .1715

Subscript is as follows:

1. Peak Flow Rate
2. Age
3. Respiratory Difference in hemithoracic vertical height
4. Body weight
5. Kyphotic angle

TABLE IV COEFFICIENTS OF MULTIPLE CORRELATION

	M E N	WOMEN
R 1.23	.602525	.527428
R 1.234	.616442	.570928
R 1.2345	.618989	.588496

TABLE V. BETA COEFFICIENTS

	MEN	WOMEN
12.345	- .3426	- .4323
13.245	+ .3958	+ .2840
14.235	+ .1234	+ .2322
15.234	- .0721	- .1649

Subscripts are again as follows:

1. Peak Flow Rate
2. Age
3. Respiratory Difference in hemithoracic vertical height
4. Body weight
5. Kyphotic angle

SIMPLE TESTS OF VENTILATORY CAPACITY

Some discussion of the simpler indices of pulmonary function is desirable before going on to review methods of grading disability, since in the present investigation only one has been available, namely, the Peak Flow Rate estimated with the Wright Peak Flowmeter.

In his study of Chelsea pensioners and civilians, Trevor Howell (1951) estimates the chest expansion, vital capacity and step test performance with a view to measuring not only ventilatory capacity but also exercise tolerance.

Instead of determining the Maximum Voluntary Ventilation by direct observation, always a difficult procedure with a severely disabled patient, M.C.S. Kennedy (1953) has found in fifty patients with chronic lung disease a high correlation between the Expiratory Flow Rate$_{40}$ and the M.V.V (Correlation coefficient $r = +0.93$). He considers this method easier and quicker, the .75 second forced expiratory volume simply being multiplied by 40, and the standard deviation is small at $\pm 5\%$.

A variation on this index has been the 1 second Forced Expiratory Volume or indirect Maximum Breathing Capacity, but a 2 second timed Vital Capacity has been demonstrated to give a useful prediction of the true Maximum Breathing Capacity (Needham et al. 1955).

Lewallan and Fowler (1955) consider the most sensitive index to be the Maximum Mid-expiratory Flow Rate (M.M.F); however the practice in the United States is to employ the Forced Expiratory Volume always in the form of a ratio of total Vital Capacity per cent (F.E.V %).

Stuart-Harris and Hanley (1955) find no simple correlation between the results of any one test and the degree of pathological disturbance present.

One example they cite is the reduction of Maximum Breathing Capacity found both in bronchial obstruction such as in asthma and in a change of lung structure such as in fibrosis. The Vital Capacity is rejected due to frequent failure to discriminate between health and disease. Although it is probably true that no correlation exists between standard ventilatory tests and the grades of dyspnoea, yet the Maximum Breathing Capacity correlates better than the others. They express it as a percentage of the predicted value. For field studies the index most readily available is the Expiratory Flow Rate$_{40}$ obtained from spirograms, which offers the clearest division between normals and bronchitics.

The prediction formula obtained for men is:

$$E.F.R_{40} = 1.59 \text{ height (cm.)} - 0.58 \text{ age (years)} - 121.9$$

Instruments for measuring expiratory flow rates have been devised, the lightweight portable meter perfected by Wright producing readings which depend more on the force put into the effort of blowing than is the case with the Forced Expiratory Volume (McDermott and McKerrow 1956).

A fair appreciation of the value of the indirect Maximum Breathing Capacity can be made following its acceptance as the most useful and accurate index. Higgins and Cochran (1958) find it adequate for field studies, giving a range from 10+ to 90+ litres per minute.

Wright and McKerrow (1959) find the Peak Flow Rate to be a stable

and reproducible measurement, valid in its own right to be considered as a useful index of ventilatory capacity. The correlation coefficient between Peak Flow Rate and .75 second Forced Expiratory Volume is reported to be $r = 0.86$. Real changes in ventilatory capacity may sometimes be concealed, by the relative insensitivity of the vital spirogram with regard to how hard the subject tries.
B.M. Wright (1960) has challenged the accuracy of peak flows estimated from spirographic tracings.
Perhaps an instrument specially designed to give estimates of flow rates may indeed give more reliable figures than estimates from such steep and variable slopes.

In their comparisons of similar populations in Bornholm and rural England especially in regard to smoking habits, Olsen and Gilson (1960) attribute Peak Flow variations between the samples to variations in cooperation. Differences in Peak Expiratory Flowrates are not significant. Nevertheless the .75 second Forced Expiratory Volume is significantly altered; despite similar tobacco consumption and similar economic status there is a reduction of indirect M.B.C and single breath Nitrogen clearance between pure cigarette smokers and pure cigar smokers in Rønne. Likewise a reduction is recorded generally between Bornholm and the United Kingdom.

In a study of 116 symptom-free men of ages 30 - 59 years, Tinker (1961) has recorded a scatter of normal values each way of 200 litres per minute. The regression equation reflects a decline with age:

$$\text{Peak Expiratory Flow} = 768 - 4.64 \text{ Age (years)}$$

In terms of sitting height, standardising for age 40 years, the equation is:

$$P.E.F_s = 247 + 3.82 \text{ sitting height (cm.)}$$

The work of Rogan et al. (1961) on chest symptoms and pneumoconiosis in 9,758 men from eight British collieries using a questionnaire, chest film and 1 second Forced Expiratory Volume estimation, illustrates the usefulness of this index in field surveys. They report a uniform fall of $F.E.V_1$ with increasing age, irrespective of pneumoconiosis or respiratory symptoms; a fall of $F.E.V_1$ associated with respiratory symptoms in pneumoconiosis which is smaller than in men with normal X-rays; and a fall of $F.E.V_1$ with increasing X-ray category of pneumoconiosis in those without symptoms, which is not paralleled for pneumoconiotics with respiratory symptoms. The fall of $F.E.V_1$ with increasing X-ray category, itself increases from low category up to higher category and Progressive Massive Fibrosis. Finally a reduction of average $F.E.V_1$ is recorded contrasting those with respiratory symptoms with those lacking symptoms, and this reduction increases with age.

The Wright Peak Flowmeter has provided a rapid and simple method of estimating ventilatory capacity in the hands of Fletcher and Tinker (1961) who record the mean of the three highest readings. There is a significant depression in mean value for men with large sputum volumes (1st hour morning specimen of more than 2 ml.)

The College of General Practitioners, on the other hand allows five tries with the meter and the last three values are averaged for the record.

Read and Selby (1961) take the highest of five readings after the patient has mastered the technique of using the meter, for the determination of Maximum Expiratory Flow. Prediction equations have been worked out for each sex in terms of height and age as follows:

Men : $M.E.F = 3.2\ H(cm.) - 2.1\ A(years) + 71$

Women: $M.E.F = 452 - 1.2\ A(years)$

The Peak Flow Rate estimated by this instrument is more liable to observer variation and less discriminating between normals and bronchitics than the 1 second Forced Expiratory Volume determination. Fairbairn et al. (1962) have compared spirometric and Peak Expiratory Flowrate readings in chronic bronchitis and normals using London postmen and women sorters contrasted with a group of hospital staff and flax workers without symptoms. The most discriminating tests are the 1 second Forced Expiratory Volume and the Maximum Mid-expiratory Flow. They find that Peak Expiratory Flow correlates reasonably well with the other indices of function, comparisons being made with the 1 second Forced Expiratory Volume and the Maximum Mid-Expiratory Flow, Forced Vital Capacity, Vital Capacity, and Forced Expiratory Volume percentage of Total Vital Capacity.

A study in the clinical use of the Peak Flowmeter by Flint and Khan (1962) confirms it as a useful instrument for excluding severe airways obstruction in cases of dyspnoea. In particular the dyspnoea of bronchitis can be distinguished from that of intrinsic heart disease since a low reading in severe cases cannot be attributed to heart disease alone and must indicate some form of bronchial obstruction. Reductions are expressed as a percentage of the mean value for a healthy population, for which a slight fall is reported for each decade up to the sixth and thereafter a sharp drop.

A study with the Peak Flowmeter in children between the ages of 2½ and 14 years has been made by Heaf and Gillam (1962). They have compared the degree of bronchospasm in asthmatic and normal children over a period of months. Correlation of Peak Flow Rate with 1 second Forced Expiratory Volume is high ($r = 0.83$ for normals and $r = 0.96$ for abnormals). The Peak Flow Rate alters significantly with age, with weight and with height between these ages.

The mean Peak Expiratory Flow Rate among normal men and women has variously been stated. There is such a wide and constant scatter that comparisons must be misleading if too strictly interpreted. The highest estimates in symptom-free men are recorded by Higgins who reports an age decline similar for each sex, the values for women being on the average 200 litres per minute less than for men. The values obtained by Fletcher and Tinker are slightly lower than those of Higgins for men, the results among non-bronchitic subjects in the survey by the College of General Practitioners being still lower than a comparable group of normal men reported by Tinker.

Estimation of the degree of airways obstruction by a simple test while of course being no complete measure of disability is generally regarded as a useful first step. In the words of the Scottish Tuberculosis Society Subcommittee in their written evidence given in the Bronchitis Report (Scottish Health Services Council 1963), doubt is expressed regarding the value of the more advanced tests of respiratory function in the routine clinical management of the patient. It is thought that certain simple tests will suffice.

GRADES OF DISABILITY

Before commenting on the present system of grading disability, some discussion of the methods employed by previous surveys seems appropriate. Many devices have been resorted to in the literature when considering standards of disability and perhaps time spent in comparing these will not be out of place. Again in this context, lack of firm common standards has limited the amount of comparative study that has been attempted.

In chronic bronchitis, Howell (1951) rates disability in terms of poor chest expansion, reduced vital capacity and the ability to climb steps from "1 only", "5 only" etc. to "over 20 steps". This test seems most suitable for the severer grades of functional limitation, but is a genuine attempt to use objective measures of disability.

Whitfield et al. (1951) have used clinical, radiological and spirometric observations of 52 emphysema patients, but correlation of radiological abnormality with clinical disability is found to be very difficult. Pulmonary function tests enable degrees of emphysema to be assessed more accurately than do radiological findings, and this is in line with more recent investigations in chronic bronchitis at various stages.

By organising the following grades of dyspnoea according to the answers obtained to five standard questions, Fletcher (1952) has given a lead in the assessment of disability:

0: As good as other men of own age and build at work, walking, climbing hills and stairs.

1: Breathing is probably as good as other men of own age and build, etc.

2: Able to walk with normal men of own age and build on the level, but unable to keep up on hills and stairs.

3: Unable to keep up with normal men on the level, but able to walk 1 mile or more at own speed.

4: Unable to walk more than 50 to 75 yards on the level without stopping.

5: Breathless on talking or undressing, or unable to leave home because of breathlessness.

This scale accommodates lesser degrees of disability equally with the more severe, but has the disadvantage that to some extent placings on it depend on subjective estimates rather than on purely objective decisions. Nevertheless in practice it is claimed to be sufficiently accurate to serve as a very useful indicator of a man's abilities.

The "dyspnoeic index" of Hugh-Jones (1952) is an attempt to produce an objective test for dyspnoea and is based on the total excess ventilation utilised in standard step test performance.

The statistical technique "discriminant analysis" is used by Gilson and Hugh-Jones (1955) to produce another objective definition of disability from function tests. The greatest differential between normal and emphysematous patients is obtained when the formula combines a) ratio of residual volume to total lung capacity, b) maximum breathing capacity, c) functional residual capacity, and d) an index of irregularity of alveolar mixing.

In a study of 67 patients with emphysema Sinclair (1955) uses five grades of dyspnoea dependent on both the history and on observations on the patient. It will be observed that the scale is more suitable for gross degrees of disablement being set approximately 1 grade above that of Fletcher:

I = normal or almost normal.

II = breathless after walking one or more miles at own pace.

III = breathless after 100 yards to one mile on the flat at own pace.

IV = breathless under 100 yards at own pace on the flat.

V = breathless at rest.

He considers vital capacity to be a truer index than the maximum breathing capacity, of disability due to emphysema in his investigation.

Grading of disability by degrees of breathlessness and then by Maximum Breathing Capacity determinations, is the method employed by Stuart-Harris and Hanley (1955). Their series of 406 volunteers from an industrial plant are divided into bronchitic and chest sufferers; and normals are compared. They distinguish two grades of clinical dyspnoea a) of such a degree as to be obvious on hills, and present for 3 years b) is more extreme and has been present for any period. Even such a straight forward classification can be difficult, the authors criticising assessments of the degree of breathlessness on the ground of frequent fluctuations and that the grading is based on subjective sensations. Four clinical grades are correlated with the Maximum Breathing Capacity 1) breathless on the level 2) breathless on stairs 3) breathless on hills 4) free from breathlessness, when a wide scatter around the mean in each group is found. The conclusion reached is that the value of Maximum Breathing Capacity determinations is limited, and such tests of ventilatory capacity should be combined with an exercise procedure.

Oswald (1958) considers that disability must take account of both severity of breathlessness and exacerbations of infection and has devised a system of six grades of disability accordingly, the method being suitable for clinical purposes but not for strict statistical comparisons. The importance of his grade II consisting of morning cough and sputum which may be constant, without dyspnoea and with negligible pulmonary disability, lies in its differentiation from grades of full blown chronic bronchitis in analyses. The degree of disability may require to be judged on one of the features alone. His system does not attempt to indicate which of them predominates or whether complications exist, being based on persistence of symptoms, degree of breathlessness, frequency of exacerbations and capacity for work.

Disability is graded as follows, by Higgins and Cochran (1958): according to persistence of cough and sputum, the occurrence of chest illness, degrees of breathlessness and finally "chronic bronchitis". Dyspnoea is graded on Fletcher's scale into:

grade 2 and over: unable to keep up with people of own age, at work, hurrying, or on hills or stairs.

grade 3 or over: unable to keep up with people of own age on the level.

Despite similar prevalence of respiratory symptoms and "chronic bronchitis" in Annandale and the Vale of Glamorgan, the Maximum Breathing Capacity demonstrates differences in the two populations. Consequently they seem justified in asserting that ventilatory capacity is a more sensitive index than the answers to the questionnaire i.e. the clinical grading.

In a comparison of smokers and non-smokers totalling 734 men aged 25 to 64 years, Higgins (1959) measures disability by means of the Maximum Breathing Capacity and significant differences are demonstrated. "Respiratory impairment" is defined as: Inability to keep up with other men of own age on hills or stairs or hurrying. No constant trend is found with increasing tobacco consumption using this criterion of disability.

Similarly in their study of respiratory symptoms in the diagnosis of chronic bronchitis Fletcher et al. (1959) group the individuals according to his five grades of dyspnoea and according to the presence of wheezing, to sputum volumes, to number of illnesses and to the mean indirect Maximum Breathing Capacity. Disability is graded as follows, according to the two criteria, number of chest illnesses and impairment of ventilation:

Chest illnesses

Grade I One illness with increase of sputum of 1 week or more in 3 years.

Grade II Two or more such illnesses in 3 years.

Impaired Ventilatory Function

I Standardised indirect Maximum Breathing Capacity of one to two S. Ds below the mean of all cases excluding Grade II bronchitics.

II Standardised indirect M.B.C below two standard deviations.

Thus Higgins, Oswald and Fletcher are in agreement by assessing disability on the basis both of the occurrence of chest illnesses and on Maximum Breathing Capacity determinations.

The Ciba Guest Symposium (1959) grades the severity of generalised obstructive lung disease by disability thus:

a. Lung impairment: objective obstruction to airflow without symptoms.

b. Lung insufficiency: persistent abnormal breathlessness.

c. Lung failure: designated on levels of arterial gas pressures.

It is emphasised that many cases with irreversible obstructive lung disease with lung insufficiency or failure are proven not to have emphysema at autopsy.

Fletcher's original gradings have been modified by the Medical Research Council Committee on aetiology of Chronic Bronchitis (1960) as follows:

I. No abnormal breathlessness.

II. Able to walk normally without breathlessness on the level but breathless on hurrying or climbing slight hills.

III. Able to keep walking at own slower than average pace on level.

IV. Forced to stop for breath walking at own slow pace on level.

V. Breathless on slight exertion such as washing or undressing.

Grading is therefore achieved by answering these four questions:-

a. Are you ever troubled by shortness of breath when hurrying on the level or walking up a slight hill?

b. Do you get short of breath walking with other people at ordinary pace on the level?

c. Do you have to stop for breath when walking at your own pace on the level?

d. Are you short of breath on washing or dressing?

The classification of 424 patients with various pneumonias and bronchitis by John Fry (1960) from general practice is according to 5 grades based on function and degree of residual symptoms, disability being attributed in grades 3 to 5.

3. Residual cough and sputum for a minimum 4 weeks in any year.
   Little loss of school or work in 5 years from respiratory illness.
4. Cough, sputum, and dyspnoea most of the time.
   More than 4 weeks off work or school in any year.
5. Complete invalids. Severe residual symptoms. Unable for effort at home or work. Deaths included here.

A disability rate before the original infection of 21% has become 43% after 5 to 10 years. He finds disability more common from chest infection in men over 40 years who smoke, belong to Social class IV and V and have a previous history of chest trouble.

His study of "wheezy chests" uses a modified scheme of gradings also based on functional disturbance as follows:

I. No attacks for 3 years.

II. Minor attacks controlled by simple treatment, no interference with routine.

III. Occasional severe attacks, some interference with school or work.

IV. Frequent severe attacks. Much interference with school or work.

V. Complete invalids. Unable for school or work. Deaths from cardiac failure.

Disability is measured by Olsen and Gilson (1960) in their comparison of the populations of Rønne in Bornholm with a United Kingdom community, on the basis of average indirect maximum breathing capacity and Peak Flow Rate values.

Rogan et al. (1961) study the incidence of pneumoconiosis and chest symptoms in 9,758 men at eight British collieries using a questionary, supported by radiographic and Forced Expiratory Volume examinations, the latter being utilised to grade disability.

The College of General Practitioners (1961) employ the Wright Peak Flowmeter to obtain objective readings on which to base disability estimates, but the clinical standard is "slower walking on the level than people of own age on account of breathlessness" (compare grade 3 Medical Research Council and Fletcher).

The inability to perform work at his present job is advocated as the most practical method of assessing disability by Comroe et al. (1958). The causes of disability in addition to cough, expectoration and haemorrhage are given as dyspnoea and pulmonary insufficiency; this latter term differing in its use in this context apparently from that employed in the Ciba symposium since it implies alteration in the arterial blood gas pressures.

Medvei and Oswald (1961) following the fate of 312 Civil servants, employ grades of breathlessness as their sole basis of assessment, the criteria being ability to work, walk and climb steps.

Disability Grades:

I. Mild: no breathlessness, or capable of moderate work but dyspnoea on heavy work.

II. Moderate: breathless on hurrying or fast walking, capable of light work, climbs 12 steps without undue distress.

III. Severe: breathless walking at moderate speed on flat or climbing 12 steps or more breathless. Capable of sedentary work.

At the end of 5 years the highest mortality is in those with severe initial disability in all age groups. The ratio of mortality compared with the general population for younger groups is 15 to 1, and for those over 55 years it is 3 to 1, the causes being mainly respiratory. It is suggested that bronchitis of sufficient severity to cause sickness absences, runs a more rapidly progressive course in young adults than it does in later life. Prognosis is also related to dyspnoea grade, the 5 year death rate of 38% for severely breathless bronchitics under 50 years of age being ominous.

Fletcher and Tinker (1961) classify bronchitis according to the character of sputum and the degree of functional impairment, thus:

1. Simple chronic bronchitis with mucoid sputum.
2. Chronic bronchitis with recurrent or persistent infection i.e. recurring chest illness with purulent sputum.
3. Chronic bronchitis with airways obstruction which may mean impaired ventilatory capacity and dyspnoea.

This is a very useful descriptive grading method in clinical practice. Bignall (1961) favours a similar classification:

1. Simple chronic bronchitis (mucoid sputum and no impairment of respiratory efficiency).
2. Complicated chronic bronchitis
   a) with evidence of infection,
   or b) with respiratory impairment.

The practical difficulty in designating individuals for a particular category in these schemes is shown when slight to moderate reduction of ventilatory capacity is encountered without regular loss of time from chest illness.

A further method which has been employed, reverts to dyspnoea as criterion. Flint and Khan (1962) detail disability as follows -

"Mild" - dyspnoea experienced only on hills or stairs.

"Moderate" - dyspnoea walking on the level.

"Severe" - dyspnoea at rest, central cyanosis or past or present cor pulmonale.

In the field of clinical trials, the length of time spent off work due to exacerbations is used as a yardstick by Elmes et al. (1957) when testing oxytetracycline for prophilaxis of exacerbations. A check on the accuracy of patients' statements is made through sickness benefit records.

The classification of disability by Glynn (1959) is also based on amount of time lost from work:

a) Mild: maximum annual interference with work 3 weeks + little incapacity.

b) Severe: off work and often in hospital.

c) Moderate: all others between these extremes.

Morrow Brown and Wilson (1959) grade their volunteers from two ironworks according to dyspnoea grades 2, 3 and 4 of Fletcher. Improvement is measured in terms of loss of working time and the indirect Maximum Breathing Capacity. They find increase of dyspnoea grade is matched by reduction in mean indirect Maximum Breathing Capacity. Subjective improvement is considered unreliable as evidenced by claims to benefit from the vaccine by controls who have not in fact anything to improve. Absence from work is a very rough guide to disability since it is probably more dependent on social and economic factors than on the patient's medical condition, and this may include means of transport, type of work done, and therapeutic preferences of his doctor.

Progress during the trial is assessed by the Joint Working Party of the Medical Research Council and the Research Committee of the British Tuberculosis Association (1959) on

1) attack rate for bronchitis or other respiratory illness,
2) mortality, and 3) protection from influenza.

The severity of disability is graded according to Fletcher's grades of dyspnoea.

In contrast, when Murdoch et al. (1959) set out to evaluate continuous therapy with oxytetracycline they grade exertional dyspnoea according to Sinclair's scale 1 to 5 already quoted. Assessment of progress is based on subjective effects on appetite and frequency of cough. The degree of purulence of sputum as judged by the patient proves too unreliable, and the numbers losing days off work is found to be more important than the average number of days off.

Disability is graded according to dyspnoea by Johnston et al. (1961) in their trial of phenethicillin in chronic bronchitis, additional objective measures being Peak Flow Rate, resting ventilation and exercise tolerance tests.

The efficacy of isoprenaline and chymotrypsin in relieving air ways obstruction by inhalation is measured in the work of Leggat et al. (1961) by changes in sputum weight and estimations of Forced Expiratory Volume.

The commonest form of clinical classification according to disability seems to be one based on the stages of the long term illness but many authors have introduced additional factors in grading the individuals encountered in a survey, for example volume and purulence of sputum and the occurrence of chest illnesses. Some regard the number and duration of exacerbations as a measure of disability almost as important as degrees of dyspnoea. The answers to graded questions on breathlessness seem sufficiently accurate for preliminary groupings but the grades of dyspnoea thus estimated are unfortunately suspect owing to lack of objectivity. The indirect Maximum Breathing Capacity correlates poorly with the answers to questions on breathlessness, Stuart-Harris and Hanley (1957) concluding that ventilatory tests alone give an inadequate picture; whereas Fletcher et al. (1959) argue the reverse, that questions about dyspnoea provide a poor indication of impairment of lung function in associations with chronic bronchitis. This view is supported by the findings of Higgins and Cochran (1958) and clearly the Ciba symposium (1959) takes cognizance of such a divergence in providing for objective obstruction to airflow without symptoms. It is unusually direct to find a relationship such as Morrow Brown and Wilson (1959) report, that grade of dyspnoea is inversely proportional to mean indirect Maximum Breathing Capacity.

Subsequent studies have all tended to include grouping by dyspnoea grade and the almost universal assessment by simple ventilatory test shows its widespread acceptance. However some seem still to favour classification by dyspnoea grade, for example Oswald and Medvei (1961) and others grade disability on ventilation test as for example Rogan et al. (1961).

The amount of enforced absence from school or work is probably reliable enough as an indicator unless in any series there should be an undue preponderance of individuals from the higher social grades.

The results of lung function tests enable assessment of cases for the presence of emphysema to be performed more accurately than does radiological examinations according to Whitfield et al. (1951).

It is common experience that some cases of radiological emphysema may not show very obvious clinical disability and conversely almost normal radiographs may be obtained in cases of gross clinical limitation of function. The general opinion is that chronic bronchitis itself cannot be diagnosed by radiographic signs alone (Shanks and Kerley 1951). Yet in bronchitis, radiology is of value in excluding other important causes of chest symptoms such as tuberculosis, tumour and fibrosis, emphysema being readily diagnosed clinically and confirmed by physical examination (Sparks and Wood 1932).

The radiological signs of emphysema also have been described in great detail and in the great majority of cases where these can be demonstrated, the diagnosis is unequivocal. Most radiologists admit there is a difficult area for decisions where one or only two of the recognised criteria exist alone (Simon 1958 in Recent Trends in Chronic Bronchitis).

Disability measured by degree of dyspnoea has been reported by Simon and Galbraith (1953) to correlate with radiological emphysema according to four diagnostic criteria, namely: low flat diaphragms, narrow vertical heart with prominence of left border below aortic knuckle, abnormal pulmonary vascular pattern and bullous changes. This association has been confirmed by Simon and Medvei (1962) but the duration of respiratory symptoms seems to bear no relation to the severity of the radiographic changes.

DISABILITY GRADES IN THE PRESENT STUDY

At the second interview each patient has been questioned regarding dyspnoea without reference to Peak Flow Rate determinations, other clinical findings or radiographic appearances. There have been some occasions when doubt has arisen in the mind of the observer whether the subject has been giving a true estimate of his present capabilities, usually in the case of a grossly disabled person who would not admit loss of former prowess but occasionally in industrial cases also exaggeration of disability has been suspected.

The original plan has been to establish three grades, corresponding as far as possible with 1) simple increase of sputum without dyspnoea.
2) intermediate or moderate disability.
3) severe limitation of function.

It is found for this series that if the cases are sorted according to grades of dyspnoea, there is a discrepancy between clinical grading and Peak Flowmeter performance, the numbers of severely disabled men in each dyspnoea grade claiming less disability than their Peak Flowmeter readings warrant, being considerable. It is difficult to see how any adjustment of his own estimate of dyspnoea could be justified unless in the case of a person who obviously claims to be able to do much more than the determination of ventilatory function will allow. Without recourse to farther tests it is reasonable to assume that a man whose Peak Flow Rate is near 200 litres per minute cannot qualify for dyspnoea grades I or II, or probably even Grade III.

The final sorting has consisted in an attempt to keep high Peak Flow Rates and low dyspnoea grades to Group I with the converse in Group III, all others being allocated to Group II, but this has had to be modified in view of the foregoing.

On the whole it seems fairer to class a man by objective performance. If the series is arranged according to Peak Flow Rates there are still instances of apparent misplacings, but it can be seen readily that by a relatively small number of transfers a reasonable grouping is possible. Peak Flow Rates of 400 litres per minute and over constitute the basis for Group I; 300-399 litre per minute for Group II; and under 300 litre per minute for Group III. It has seemed reasonable to down grade men from Group I to Group II when their dyspnoea grade is not in keeping with the criterion "no dyspnoea", but upgrading from Group III to Group II on account of lesser grades of dyspnoea has not seemed legitimate. It may be that a few individuals in Group II could also qualify in the same way for a transfer to Group III because of claims to greater breathlessness than grade 3 but on the whole it has appeared that by this method fewer wrong placings are likely than by any other scheme.

SOCIAL and CLINICAL ASSESSMENT

Patients are grouped for the next part of this study using the Chi square technique, into the same disability groups I, II and III and further for each sex into two groups aged respectively under 50 years (younger) and 50 years and more (older). There is a total of 358 men and 197 women comprising 99 men and 124 women in the younger group, and 259 men and 73 women in the older group. The distribution according to the disability groups appear in Table I.

Data collected from the enlarged questionnaire and notes of the clinical examination are grouped as follows:-

1. Estimate of some diagnostic criteria.
2. Social study.
3. Medical history and smoking habits.
4. Clinical attributes including special reference to signs of emphysema.

These will be discussed in turn.

(Immediately following the Chi square, where it is necessary for clarity, the Table from which it is derived, is noted).

DIAGNOSTIC CRITERIA

1. ADMITS BRONCHITIS

It is widely held that chronic bronchitis is a condition without definition, yet the patient may decide on the diagnosis himself. Frequently the doctor and patient arrive at this conclusion without any specific criteria being fulfilled. In the College of General Practitioners' study (1961) it is obvious in this connection that the diagnosis as made by the practitioners themselves diverges widely from the "standard diagnosis". It seems desirable that we assess how frequently such a state of affairs arises in this series.

2. PHLEGM ADMITTED IN THE MORNING AT LEAST IN WINTER

A few individuals are included in the study who cannot subscribe to the full criteria which have been suggested. In the case of the basic morning phlegm in winter, regarded as essential in the Medical Research Council Memorandum on diagnosis (1961), it seems worthwhile to make a comparison in order to assess the influence of the inclusion of a small number of doubtful intermittent "catarrhal" cases.

3. HISTORY OF SPUTUM BY DAY IN WINTER

Many individuals deny this symptom yet display appreciable evidence of bronchitis in other directions. Accordingly it will be of interest to find whether there is an important association for disability.

4. COUGH AND SPUTUM AT LEAST THREE MONTHS OF THE YEAR

The duration set at an arbitrary "at least 3 months of the year" has become the accepted criterion on the basis of a series of studies to be mentioned elsewhere, but at no point is it claimed that a duration of several weeks more or less can be used to determine whether the condition will be persistent or remain temporary. It will be valuable to elicit any difference by a contrast between those who do and those who do not fulfil the criterion.

5. MINIMUM DURATION OF TWO YEARS

In only a mere handful of instances has it seemed correct to include a case where the duration is less than 24 months in all, and then only in view of extreme persistence of symptoms. These few may provide the material for a contrast in view of Fletcher's comment that symptoms need not be shown to be perennial to qualify (1959).

6. NOTICEABLY BREATHLESS

An admission of breathlessness is an essential element of one conception of chronic bronchitis, to another it is merely a sign of increasing disability. Dyspnoea without qualification as to severity may seem rather too vague a quantity, yet its relation to sex, age and disability could prove to be interesting.

7. NOTICEABLY WHEEZY

Noisy breathing features prominently in many descriptions of chronic bronchitis whatever the actual words employed in this context: whistling, crickling, wheezling or "nest of kittens". All indicate bronchospasm of audible degree, noticeable to doctor and patient, not to mention his friends and more especially his spouse.

Such a small minority deny wheeze that it becomes essential to consider its importance as a symptomatic criterion.

8. ANNUAL SPELL IN BED FOR THE LAST THREE YEARS

The recurrent exacerbation being typical, it would be of great value to know whether it is invariable or only occurs in a proportion of cases.

9. RECURRINGLY "CHESTY", SHORT OF RESORTING TO BED

In order to assess the importance of the insiduous type of onset, for example those commencing as "asthmatics" this question is included.

DIAGNOSTIC CRITERIA

1. ADMISSION OF BRONCHITIS

For men, only in the intermediate grade of disability is there any significant relationship between age and the numbers admitting bronchitis: amongst older ages fewer men than expected are observed to admit bronchitis and in younger ages more men than expected do so.

(X^2 = 8.423 df = 1 P $<$0.01 in disability group II)

In disability group III a similar trend with age does not attain statistical significance. (Table I a.)

In terms of severity of disability in both younger and older age groups men of slightest disability admit bronchitis in fewer instances than expected, and conversely those of greatest disability admit it more often than expected.

(X^2 = 5.231 df = 1 P $<$0.05 in younger age group)

(X^2 = 19.90 df = 2 P $<$0.01 in older age group) (Table I b.)

For women, age does not influence significantly the relation of observed to expected numbers admitting this label. On the other hand when degree of disability is considered for women there is an increase of observed over expected numbers admitting bronchitis in disability group III and correspondingly fewer in group I than expected. In addition, fewer are observed than expected in group II.

(X^2 = 8.829 df = 2 P $<$0.02 for all ages. (Table I b.)

2. PHLEGM ADMITTED IN THE MORNING AT LEAST, IN WINTER

For men, age seems to have no significant relation to the proportion of observed to expected numbers denying this symptom; however, when disability is considered it is found that more men from the least disability group deny this symptom than could be expected if disability and morning phlegm in winter are not related, and conversely fewer men from the intermediate and greatest disability groups are observed to deny such production of phlegm.

($X^2 = 4.234$ df = 1 $P < 0.05$ for all ages) (Table II b.)

For women, neither age nor disability are found to exert a significant influence on the numbers admitting or denying this symptom.

($X^2 = 1.474$ df = 1 $P > .20$ in group I and II disability)

($X^2 = .050$ df = 1 $P > .80$ in group III disability) (Table II a.)

($X^2 = .014$ df = 1 $P > .90$ in all ages) (Table II b.)

3. HISTORY OF SPUTUM BY DAY IN WINTER

For men significance can be attributed to the influence of age in the intermediate disability group II only. Older men report absence of sputum by day in winter in fewer cases than expected, but younger men deny such symptoms more often than expected.

(X^2 = 14.57 df = 1 P $<$0.01 in disability group II) (Table III a.)

A similar trend noted in disability group III is not of statistical significance.

When the effect of disability is considered, among older men the greatest disability is associated with denial of sputum by day in winter in fewer cases than expected, intermediate degree of disability being similarly aligned whereas men from the least disability group more often than expected deny these symptoms.

(X^2 = 8.254 df = 2 P $<$0.02 in older age group) (Table III b.)

Among younger men no significant influence is traced to disability.

For women, the influence of age is not significant in the greatest degree of disability group III, but in the lesser disability groups I and II combined it is observed that older aged women deny sputum by day in winter more often than expected and younger women deny it less often than expected.

(X^2 = 6.960 df = 1 P $<$0.01 in combined disability groups I and II) (Table III a.)

Increasing disability has no significant influence on the numbers admitting or denying phlegm by day in winter.

(X^2 = .430 df = 2 P $>$ .80 in all ages) (Table III b.)

4. COUGH AND SPUTUM FOR AT LEAST THREE MONTHS OF THE YEAR

For men, in none of the three disability groups is there a significant influence of age on the numbers admitting this measure of chronic bronchitis.

(X^2 = 2.344 df = 1 P $>$.10 in disability group II). (Table IV a.)

Likewise when the influence of disability is considered, the differences between observed and expected numbers admitting this duration each year, are not significant.

(X^2 = 2.303 df = 2 P $>$.30 in all ages combined) (Table IV b.)

For women, neither the influence of age nor of disability is significant in this respect.

(X^2 = .384 df = 1 P $>$.50 in all ages) (Table IV b.)

5. MINIMUM DURATION OF TWO YEARS

The numbers not admitting this criterion are too small to allow proper analysis. No significance can be attributed either to age or to disability for men or for women.

(For men X^2 = .398 df = 1 P $>$.50 in all ages combined) (Table V b.)

(For women X^2 = .703 df = 1 P $>$.30 in all ages combined).

6. NOTICEABLY BREATHLESS

For men, in none of the disability groups does age exert a significant influence on the numbers admitting appreciable breathlessness.

(X^2 = 0.63 df = 1 P $>$.30 in group I disability)

(X^2 = 2.1 df = 1 P $>$.10 in group II disability) (Table VI a.)

(X^2 = 3.24 df = 1 P $>$.05 in group III disability)

With reference to disability itself there is a decided association for this symptom. For men in both disability groups II and III there is an increase over observed numbers admitting breathlessness, the degree of bias being highly significant.

(X^2 = 52.5 df = 2 P $<$ 0.01 in all ages) (Table VI b.)

For women, again age exerts no significant influence on the numbers admitting breathlessness, but disability considered alone is demonstrated to be a highly significant factor. In slight disability the observed numbers fall below the expected level and in the greater degrees of disability the observed numbers exceed the expected admitting appreciable breathlessness.

(X^2 = 13.766 df = 1 P $<$ 0.01 in all ages) (Table VI b.)

7. NOTICEABLY WHEEZY

For men, no significance can be traced for the influence of age on the numbers admitting this symptom. Those not admitting wheeze are in such a minority that no reliable estimate is possible. On the other hand with all ages summated, the influence of disability appears significant. Among the severely disabled, fewer than expected are observed to deny wheeze, whereas in disability groups I and II more men than expected deny this symptom.

(X^2 = 8.784 df = 2 P $<$0.02 in all ages) (Table VII b.)

For women there is no significant influence in relation to either age or to disability.

(X^2 = .033 df = 1 P $>$.80 in disability groups I and II)

(X^2 = .018 df = 1 P $>$.50 in disability group III) (Table VII a.)

(Combining all ages X^2 = 3.022 df = 2 P $>$.20) (Table VII b.)

8. ANNUAL SPELL AT LEAST ONCE IN BED IN EACH OF LAST THREE YEARS

For men no significant differences are demonstrable in association with age groupings. When all ages are combined, disability groupings show no significant divergences between observed and expected numbers admitting a history of "off work and in bed" in each of the last three years.

(X^2 = 3.425 df = 2 P $>$ .10 in all ages) (Table VIII b.)

Nevertheless disability group III shows an increase and group I and group II both show a decrease compared with the expected numbers.

For women, there is again no significant variation with reference to age, and such differences with regard to disability as are seen, do not reach statistical significance.

(X^2 = 1.842 df = 2 P $>$ .30 in all ages) (Table VIII b.)

9. RECURRINGLY "CHESTY" BUT SHORT OF RESORTING TO BED

For men, no relation between age or disability groupings and significant variations in the numbers observed and expected to complain of chest symptoms without suffering loss of work, can be shown to exist.

(X^2 = 3.0 df = 1 P $>$ 0.05 in group I disability)
(X^2 = .03 df = 1 P $>$ .8 in group II disability) (Table IX a.)
(X^2 = .51 df = 1 P $>$ .3 in group III disability)
(X^2 = 1.15 df = 2 P $>$ .5 in all ages) (Table IX b.)

For women, substantially the same result is obtained.

(X^2 = 2.022 df = 1 P $>$ .10 in group I disability)
(X^2 = .157 df = 1 P $>$ .50 in group II disability) (Table IX a.)
(X^2 = .195 df = 1 P $>$ .50 in group III disability)
(X^2 = .058 df = 2 P $>$ .95 in all ages) (Table IX b.)

DISCUSSION

DEFINITION OF CHRONIC BRONCHITIS   CRITERIA OF DIAGNOSIS

Researches into chronic bronchitis in the past decade or so have been along several well defined avenues, the more important for the present purpose being: 1) Formulation of definitions

2) Epidemiological study of environmental and social factors

3) Lung function tests

The elaboration of criteria for diagnosis has gone forward hand in hand with epidemiological studies. Accordingly a review of the criteria used will not be complete without some reference to the methods employed in field studies.

Following the reawakening of interest in chronic bronchitis after an interval of about fifty years, the epidemiological approach has yielded some solid results using the methods of statistical analysis, and clinical studies in groups of patients have been carried out with the same objectives in mind.

A series of 53 Chelsea pensioners with chronic bronchitis has been studied by Trevor Howell (1951) using a questionnaire modelled on that of Dobell (1875) and these service cases have been compared with 71 individuals in a civilian series. No precise definition of chronic bronchitis is attempted but the symptoms detailed are cough with expectoration and dyspnoea, all cases in which any doubt remains being excluded before analysis is undertaken. The earliest stage described

is winter cough lasting perhaps a week or so each year.
He demonstrates that as a rule cough precedes dyspnoea; indeed shortness of breath limiting activity may not occur until several years have elapsed.

The passage of years has seen a bewildering number of variations in the pattern of criteria necessary for the firm diagnosis of chronic bronchitis, some definitions specifying disability and others requiring no such limitation of the scope. Lack of agreement on an acceptable definition is perhaps not so surprising in an area beset with so many unknown quantities.

A definition based on description and exclusion has been proposed by Scadding (1952) as follows: Chronic bronchitis refers to the condition of those patients suffering from chronic or recurrent cough and expectoration and usually effort dyspnoea, in whom these symptoms are not caused by disease of the lungs, by localised disease of the bronchi trachea or upper respiratory tract or by primary cardiovascular disease. This, be it noted, makes no reference to any prescribed duration.

Disability is included as an essential requirement in the definition of Neville Oswald (1953) in a study of 1000 adult bronchitics of all ages at the Brompton and other hospitals: The term "chronic bronchitis" should be used after other causes of breathlessness and cases more appropriately termed "asthma" and "emphysema" have been excluded, when breathlessness exceeds that of normal people of the same age and sex, or exacerbations of infection interfere materially with the mode of life or both, and such disability has been present for at least a year, not necessarily continuously. Mild bronchitis without disability is recognised but its limits are not defined, beyond occasional cough and sputum possibly following colds in the head or smoking. The duration of symptoms and frequency of exacerbations are not specified.

By contrast, chest illnesses are utilised as a criterion in the definition of Higgins and his colleagues in the Pneumoconiosis Research Unit of the Medical Research Council in a series of surveys by random sample for epidemiological purposes (Higgins et al. 1956): Persistent sputum with at least one chest illness in the past three years. "Persistent cough and sputum" means cough and sputum for some part of the day, most days for at least three months in the year and by "chest illness" is meant at least one bronchitic chest illness during the past three years severe enough to keep a man off work for a week or more.

It is presumably thought sufficient to apply the test of one bronchitic chest illness in the space of three years of such severity as to keep a man off work 1 week in a population survey, to ensure that genuine "bronchial characters" however mild will be included.

On the other hand D.D. Reid employs (1956) a strictly utilitarian definition: That condition which is described as chronic bronchitis by general practitioners when they complete certificates of causes of incapacity or of death. This is explicit enough when using sickness certificates and mortality rates as measures of prevalence but in clinical terms it avoids the issues raised by the lack of agreement on the dividing line to be drawn between simple bronchial "catarrh" and established chronic bronchitis with disability.

A study of rural, urban and coal mining populations in the United States by Pemberton (1956) is based on the simplest criteria of chronic cough and sputum; however, valid comparisons with similar surveys later in this country are precluded by the following qualifications:

a) Cough, apparently due to smoking only, is excluded,

b) Additional criteria are called upon in difficult cases, i.e. the occurrence of chest illnesses and whether colds go to the chest.

An essential ingredient in the definition of Stuart-Harris and Hanley (1957) in addition to persistent cough and sputum, is breathlessness. In a study of 2519 employees of a mixed engineering and chemical works and a rural population of 550 persons, the symptoms recorded are classified A,B,.. to G; and group G which corresponds to full blown chronic bronchitis includes persistent cough and sputum with prolonged or severe breathlessness. It is striking how much more common annual attacks of bronchitis are in this group than in all others not excepting Group E which is persistent cough with sputum without severe dyspnoea. It would appear from this finding that annual attacks of bronchitis could equally be taken as a criterion.

It is admitted that some patients in the earliest stages may be missed by this definition but it is preferred to take this risk rather than include a number of healthy persons under the heading of bronchitis.

The ability of clinical examination to distinguish the two is doubted, only long-term follow up by the general practitioner showing which of the sufferers from persistent cough and sputum without breathlessness will develop chronic bronchitis and which will never do so.

There is clearly at this point a gap in our knowledge of the natural history of the illness, when it is still too early for frank disability to be recognised. It seems possible that different workers by drawing their line arbitrarily at different levels, may be creating difficulties. It is therefore necessary to have soundly based evidence acquired through statistical studies before making sweeping exclusions. It can hardly be claimed that persistent sputum is normal whatever its causation.

A most instructive investigation by random sample of selected households from the populations of Newcastle upon Tyne by Ogilvie and Newell (1957) contrasts 464 bronchitics and 485 non-bronchitics. There is no criterion of disability in their definition: Chronic bronchitis is recognised as a long standing condition, the essential features of which are cough with sputum, persistent through the winter or throughout the year in the absence of other causative respiratory disease. A minimum duration of two years is essential for its recognition.

Generally, workers in the field of therapeutic trials will deal primarily with established disease and their criteria will often be more restricting. For example, the cases of May and Oswald (1956) are characterised by persistent pus in the sputum or repeated exacerbations or both, associated with Haemophilus influenzae infection. The regime is preferably tetracycline, side effects being more frequent with oxytetracycline; 22 out of 37 patients treated for six months show overall improvement, remaining purulent free. Head colds fail to go to the chest as they used to do, so frequently.

Another instance is the work of Elmes et al. (1957) on the prophilactic use of oxytetracycline in exacerbations contrasting 42 cases with 46 controls, where the definition is: Productive winter cough for not less than three years during which time have occurred at least two illnesses with purulent sputum causing loss of time from work.

Glynn (1959) in a study of Haemophilus Influenzae antibodies in chronic bronchitis utilises the more restricted definition: Chronic productive cough and breathlessness of minimum duration of two years.

The criteria for inclusion in their study of Influenza Vaccine and Chronic Bronchitis by the Joint Working Party of the Medical Research Council and the Research Committee of the British Tuberculosis Association (1959) is a farther variant: Productive cough for at least two months each winter over the previous three years.

In a trial of Haemophilus Influenzae vaccine in chronic bronchitis in Industry, Morrow Brown and Wilson (1959) employ gradings based on the definitions of Ogilvie and of Higgins:

Grade 0 means symptoms insufficient to warrant the diagnosis.

Grade I corresponds to Ogilvie's - cough and sputum all winter for 2 years.

Grade 2 corresponds to Higgins' - constant phlegm, some part of the day most days for at least three months in the year, and at least one chest illness in three years severe enough to keep off work 1 week. More recent work continues to exhibit variation of the definitions employed, for example in a trial of isoprenaline and chymotrypsin in chronic bronchitis, Leggat et al. (1961) specify: Winter cough and sputum for three years or more and absence from work at least once during that time with bronchitis.

Johnston et al. (1961) in a trial of phenethicillin in chronic bronchitis in working men aged 30 to 65 years, define the condition thus: History of bronchitis of three years during which there have been two absences at least from work.

In allocating cases to various antibiotics for trial in exacerbations of chronic bronchitis with purulent sputum, Ayliffe and Pryde (1962) define the condition as: Production of phlegm on most days for as much as three months in each of the last three years. All 35 patients had acute exacerbations before admission to hospital for treatment and accordingly this must be a criterion for the purposes of the trial.

(1958)

In "Recent Trends in Chronic Bronchitis" the earlier definition of Oswald seems to be modified as follows: Chronic Bronchitis is a chronic affection of the bronchi and bronchioles having cough sputum and breathlessness as its outstanding symptoms. It is described as an ill defined group of respiratory disorders having a common pathology and from which allergic asthma and primary emphysema rather rigidly defined, have been excluded. Dyspnoea must be present in all cases to qualify. However he recognises the need to include in statistical studies some allowance for his "grade 2" i.e. morning cough and sputum without dyspnoea or disability, affecting as it does half the adult population, the majority of which he has no reason to suppose will ever develop frank chronic bronchitis. Unfortunately this is the sort of general assertion which in this work must either be substantiated by solid statistical findings or discarded as misleading. Unless some disability is a prerequisite, anybody having occasional cough and sputum possibly related to smoking must be included, it seems to him. As regards disability, any case may require to be judged on either breathlessness or exacerbation of infection, but the onset maybe altogether sudden or it may be so insidious that within several years it cannot accurately be recalled, minor degrees being very difficult to define.

The definition of Simpson (1958) is less precise but describes the clinical course thus: Chronic bronchitis means recurring winter cough and sputum initially without bronchospasm, in an individual without any radiographic evidence of serious disease of the lungs. Emphysema can be diagnosed when such an individual becomes progressively short of breath in the absence of bronchospasm or left ventricular failure.

The survey of a rural population in Annandale by Higgins and Cochran (1958) can be compared with previous findings in the Vale of Glamorgan and Leigh in Lancashire because in both studies the same criteria apply, namely those already attributed to Higgins.

Plainly, no agreement has been reached up to this point as to minimum duration viz. 1, 2 or 3 years; whether the definition is to include precise criteria of minimum annual duration of sputum production, whether disability must be included, whether such disability requirement can be met by dyspnoea or by recurring chest illness, and if so, how frequent in a period of years, whether sputum must be purulent in such exacerbations and whether intermittent breathlessness can qualify.

The earliest stage is included by Fletcher et al. (1959) by defining Chronic Bronchitis as production of phlegm on most days for at least 3 months of the year. Disablement is not considered essential, but gradings are based on persistence of sputum through the day. All those who cannot produce sputum are excluded. Grade I is for sputum production in the morning only or later only, Grade II is for sputum produced all day. No duration in years is specified.

In contrast to clinical studies, it is not considered necessary to exclude other causes of chronic productive cough in epidemiological work in Great Britain since chronic bronchitis is so much more prevalent than any other cause. Like Ogilvie and Newell, these workers have a declared interest in the earliest phase before any disability shows, and a parallel is drawn with hypertensive patients lacking symptoms and chronic nephritics without uraemia. In an essential piece of epidemiological research this group reaches the conclusion that phlegm production is significant whether or not there is a complaint of cough, but unproductive cough can safely be excluded. Whether the phlegm is said to be perennial or not appears not to matter.

A fresh attempt to produce a definition agreeable to all authoritative English opinion has been made at the Ciba Guest Symposium (1959) at which Scadding's definition is superseded by the following which emphasises the pathological basis of the condition: Chronic Bronchitis refers to the condition of subjects with chronic or recurrent excessive mucus secretion in the bronchial tree; that is, occurring on most days for at least three months in the year during at least two years. It means cough, chronic or recurrent, with expectoration not attributable to the exclusions from chronic non-specific lung disease as follows:

1. Localised lung disease e.g. Pulmonary tuberculosis, pneumonia, bronchiectasias, cystic disease
2. Generalised specific disease e.g. Miliary tubercle.
3. Pneumoconiosis
4. Collagen diseases and generalised pulmonary fibroses and granulomata

5. Primary cardio-vascular and renal diseases

6. Diseases of the chest wall

7. Psychoneurosis

This represents a considerable increase in specific exclusions compared with the definitions of Oswald and even of Scadding.

The Editorial view of the British Medical Journal (1960) is clearly ranged with the more inclusive definition: the cardinal symptom of chronic bronchitis is habitual expectoration of mucoid sputum. Any other symptoms such as febrile attacks, haemoptysis, and sustained or recurrent dyspnoea may co-exist but are not essential to the clinical diagnosis.

The standard questionary issued by the Medical Research Council Committee on the aetiology of chronic bronchitis (1960) calls for specific interpretations of detailed criteria. Habitual production of phlegm is required on most days for 3 consecutive months of the year each year (whether it be in the morning or by day, in winter or summer is incidental). Up to six coughs a day is considered occasional or normal, but occasional phlegm i.e. twice or more a day, is abnormal. Regular winter exacerbations of three weeks or more, whether or not entailing loss of work are only provided for, to assist in grading. By this means the inclusion of a complete range from the mildest to the most severe will be ensured after adequate clinical exclusions. Fairbairn et al. (1961) described chronic bronchitis in these terms: Phlegm in winter on rising and throughout the day with two or more illnesses causing sickness absence in the past three years, i.e. equivalent to the chronic bronchitis with recurrent infection of Fletcher (1956).

In a review of recent researches Bignall (1961) considers all definitions to be arbitrary. There is nothing wrong with altering the particular criteria to suit the needs of the clinical or epidemiological study in view.

It is of course true that without a variety of approaches no headway can be expected in this field of enquiry, however it must be said that for comparisons of various studies to have any value, simple precise standards must be worked out. The attainment of a suitable agreed definition is important in order that everyone, not only the research worker concerned, knows the meaning of statements affecting "chronic bronchitis".

The countrywide survey conducted by the College of General Practitioners (1961) compares cases satisfying the criteria for "standard diagnosis" suggested by the Medical Research Council, with those diagnosed by the general practitioners who have supplied the samples.

The definition used by Flint and Khan (1962) in a study of Peak Flow Rate comparisons in health and disease seems to be: chronic cough in the winter months or all the year.

Until now it may be asserted that workers have seldom used the same yardstick unless they should happen to be within the same research team. It is revealing to find how many variations have been explored, when a short list of workers is compiled with their personal standards.

Definition without disability		Definition with disability	
Howell	cough and sputum	Scadding	chr.or recurr.C&S + dyspnoea
Pemberton	chronic C & S	Oswald	C&S + disability (dyspnoea or exacerbn. for 1 yr.
Ogilvie & Newell	2 yrs. C&S winter	Higgins	C&S 3 mths. for 3 yrs. + illness 1 week in 3 years
Simpson	winter C&S	St-Harris & Hanley	C&S + prolonged or severe dyspnoea
Fletcher et al.	C&S 3 mths.each yr.	College of G.Ps	C&S winter + illness 3 weeks in 2 years
Ciba Symposium	C&S 3 mths. 2 yrs.	Fairbairn et al.	a.m. phlegm winter + 2 illnesses off work in 3 years.
B.M.J	habitual mucoid sputum		
M.R.C	chronic C&S 3 mths. of yr.		
Flint & Khan	chronic C&S 3 mths.yr.		

It may be considered more just to class the criteria of Higgins among those "without disability" since his test of a single bronchitic illness in the past three years can be judged sufficient only to exclude those who may never go beyond the stage of increased mucus production. It seems doubtful whether the fears expressed by the Sheffield workers in regard to the inclusion of healthy people as bronchitics may be allayed by such a device.

Criteria for Trials

May and Oswald	Persistent pus or repeated exacerbation
Elmes et al.	Winter C&S 3 yrs. + 2 illnesses off work, purulent sputum
Glynn	Chronic C&S + dyspnoea 2 yrs.
M.R.C & B.T.A	C&S 2 mths. winter 3 yrs.
M. Brown & Wilson	Winter C&S 2 yrs. for 1st grade
Leggat et al.	Winter C&S 3 yrs. + 1 absence from work
Johnston et al.	Bronchitis 3 yrs. + 2 absences from work
Ayliffe & Pryde	Phlegm 3 mths. 3 years

When these rather special instances are extracted leaving the field surveys and the clinical studies, the most extreme divergences are eliminated.

It is of considerable interest to find that according to Fletcher, the duration of symptoms beyond one year need not be considered, since whether phlegm is perennial or not does not influence the diagnosis.

There can be no argument about the existence of an early stage of chronic bronchitis before functional disability is evident but a real cleavage of opinion exists as to whether all such cases are potential candidates for the more advanced stages. Only a carefully conducted progressive study occupying many years, perhaps more than one observer's working lifetime being necessary, may finally answer the question.

Meantime the firm standards produced by the Medical Research Council can form a solid basis for coordinating the work in various fields, despite the reservations in some quarters regarding the inclusion of mild reversible symptoms. There can be no objection to the use of criteria special to the particular needs of the investigation in hand but the overall use of common standards is necessary if subsequent contrasts with other evidence is readily to be accomplished.

It seems that a choice of three months morning sputum for the past two years is adequate for preliminary screening in a survey of cases for clinical classification, and this is the criterion which has been utilised for the present study.

DISCUSSION

DIAGNOSTIC CRITERIA

Among the members of this series, included because they conform to the standard criteria, namely productive cough in the morning in winter for at least three months for the last two years, certain associations with disability have been shown to be significant. For completeness the analyses have been worked out with regard to each of the criteria yet it must always be borne in mind that the figures relate to grades of disability, not to prevalence of bronchitis as in most of the surveys quoted in the literature. The disability groups II and III of this series may be considered to correspond to the "chronic bronchitis" of Oswald, and disability group III alone may be very close to the group G of Stuart-Harris and Hanley.

The individuals of this survey demonstrate a significant association between disability and the admission of bronchitis for both sexes, a significant relation for men but not for women with the admission of phlegm in the morning at least in winter, and only for older aged men with a history of sputum by day in winter. There is no significant association of disability with the three months duration of cough and sputum nor with the minimum duration of two years, for either sex. This seems to support the findings of Fletcher that symptoms need not be perennial to qualify, provided careful enquiry elicits their presence. In contrast there is the view of Ogilvie and Newell that persistence of symptoms is the essential pointer to the diagnosis.

As must be expected there is a significant association of disability in this series with breathlessness for each sex and with wheeziness for men of all ages (but not for women). It seems proportionately more women wheeze in lesser disability. However, no significant association of disability with an annual bronchitic illness necessitating bed and loss of work has been shown for either sex in this series. This bears out a general impression that many of those more grossly disabled individuals are permanently out of employment and lead sheltered lives, whereas lesser disabled men may often be forced by economic circumstance to try to carry on in relatively arduous conditions and thereby lose time more frequently. The last question, regarding recurring chestiness short of illness requiring resort to bed, shows no significant association with disability for either sex, being probably too vague an entity for the patients. About half the men and a quarter of the women admit it throughout all grades of disability.

A previous history of bronchitis is claimed in only 14% of the bronchitics in the study of Trevor Howell (1951) although a further 32% register other previous respiratory illnesses including tubercle.

By contrast repeated acute respiratory episodes feature in the previous history of 71% of bronchitics and only 13% of controls in the Newcastle survey of Ogilvie and Newell (1957).

Stuart-Harris and Hanley (1957) find annual attacks of bronchitis occur less commonly for their group G, in the rural than in the industrial population. Group E which is not characterised by gross dyspnoea, has a much less common previous history of bronchial attacks of about the same order as those found in groups A, B and C. The industrial population at least contains a disproportionate number of older people in group E and it may be that an age influence must be taken into account.

SOCIAL STUDY

1. FATHER'S SOCIAL CLASS

During the formative years the means of the parent as indicated by the father's status in the social structure, may be expected to play a major part in the determination of liability to illness of such long term attributes as chronic bronchitis. It seems legitimate to make a study of the social class of father in relation to subsequent disability.

2. FATHER NOT IN REGULAR WORK

Perhaps a more accurate indication of the parent's means within his group may be gained by dividing the breadwinners into those who can keep a regular job and those who for one reason or another cannot do so.

3. MOTHER WORKED REGULARLY AFTER MARRIAGE

It seems just as important that cognizance should be taken of the ability of the mother to care for her offspring and this question has been devised to give guidance regarding time normally spent in the home which is turned to other uses by the working mother.

4. PATIENT'S EDUCATIONAL STANDARD

In this section the patient's own educational history is the yardstick excluding from lesser education any day schooling beyond the third year standard and also those who have attended continuation classes. It is perhaps debateable whether in fact we are measuring intelligence by this means or simply earning capacity.

5. APPRECIABLE LOSS OF SCHOOLING

Enquiry into loss of schooling from illness is taken as a guide to previous medical history, since absence from other illness seems minor.

6. STARTED WORK AFTER FIFTEEN YEARS OF AGE

A delay in starting work on account of illness may be expected to parallel handicap from repeated bronchial experiences in a number of cases, especially in those where the train of events has begun early in life or at least during the school years.

7. EXPOSURE TO DUST

For this study all men and women in the series have been asked whether their work has entailed exposure to dusty conditions, no attempt being made in this section to differentiate between silica or other recognised harmful industrial dusts and less noxious material carried on the air.

8. EXPOSURE TO DRAUGHTS

This and the following questions are intended to find the influence of working conditions of extreme discomfort, since previous investigations seem to indicate they may be conducive to chest complaints.

9. WET CONDITIONS AT WORK

10. EXTREMES OF TEMPERATURE

11. COLD CONDITIONS

12. FUMES

It is widely supposed that changes of temperature, wet and cold conduce to the catching of "chills". So frequent is the assertion that bronchitis is related to fume conditions of various kinds that this must be assessed separately.

13. INDOOR WORK

A distinction is drawn between work principally outdoors and conditions wholly indoors where workers are generally protected from the rigours of our damp climate and usually under comfortable even room temperatures.

14. OUTDOOR WORK

Predominantly outdoor jobs, by contrast mean a danger of wettings perhaps without facilities for drying off. This was certainly so in the past. "Shed conditions" which obtain in many of the heavier industries in this area, may be almost as great a risk to health and so have been included. Draughts, incomplete protection from rain and snow, and difficulty in regulating the atmospheric temperature together with exposure to dust or fumes, seem to be the main hazards.

15. UNDERGROUND WORK

This must be considered as a separate entity since it constitutes a rather special series of hazards. In this part of the world it may mean a long climb to work over rough roads, heavy manual work in a cramped space in near dark, often lying in water, the air being laden with cordite fumes and dust which may contain dangerous amounts of silica.

16. PATIENT'S OWN SOCIAL GRADE

It has been thought worthwhile to trace the social beginnings of the patient in case his origins may exert an important influence. Now the patient's own attainments in regard to earning power are to be studied. In the case of a married woman the husband's grading is adopted for comparative purposes.

17. GREAT NUMBER OF CHANGES OF EMPLOYMENT

An excessive number of changes of employment may be due to an inability to keep a job or to lack of availability of regular work. In many instances the individual seems to have cast around many different types of work before eventually settling in one trade or perhaps labouring to it, and in other cases never seeming to settle reasonably well at any time. No attempt has been made to probe the reasons for this instability whether due to personal factors or to lack of jobs in the area. The intention has been to study unstable work as a direct factor in relation to degrees of disability due to chronic bronchitis.

18. TRAVELLING IN SMOKING COMPARTMENTS

The habitual use of "smokers" in trains, buses and trams could constitute an additional hazard to the bronchi in a person perhaps already subject to attacks of bronchitis. Whether or not he is a smoker himself, to share the air of crowded compartments with many other smokers may well complete a triad of inhalational risk consisting of general atmospheric pollution, personal smoking habits and particular deleterious atmosphere - in this case the smoking of others in confined spaces.

19. WIDE INTERESTS

In an endeavour to assess in some degree the psychological background of the patients under study, questions about a series of outside interests and activities have been put, a dividing line being later drawn between those with few and those with many interests.

20. AGE AT MARRIAGE

It may be said that by and large, the age at marriage is a reflection of the social grade of the subject under discussion. Whether this is true in the aggregate, the burden of additional responsibilities and the stresses of raising a family, handicapped by lack of experience, limited earning power and inadequate housing must be an important factor to be considered in the maintenance of standards of health.

21. MARITAL STATUS

For the purpose of comparisons those widowed and divorced are included with the married men and women provided they can claim to have lived a number of years together with their spouse. The aim has been to take the marriage status as an index of the general type of life led throughout a period of years since the causative factors in a long term illness may be linked with the absence of those additional safeguards to health provided by the watchful eye of a spouse. On balance perhaps a degree of extra care and attention with increased security may be assumed in the married state?

22. HOUSING. NUMBER OF ROOMS OCCUPIED

The average number of rooms inhabited by the patient's family is estimated after careful enquiry, covering not only the present time, but also the early part of his life including any periods spent with relatives before acquiring a home of his own. The object is to obtain an average value which will be a true indication of how he has fared for comparison with others.

23. NUMBER OF INDIVIDUALS IN THE HOUSEHOLD

Size of household for this purpose is also rated as an average over the years including any periods spent in lodgings or with relatives. The effect of overcrowding may be most important in the years immediately preceding the onset of symptoms but who can say in retrospect precisely which have been the formative years.

24. INSANITARY HOUSING

For this purpose patients in the series are grouped according to whether they have experienced a frankly damp house or a home structurally unsound.

25. RATIO OF PERSONS TO ROOMS OCCUPIED

Expressed as a ratio the two factors of numbers of rooms and number of individuals may be expected to provide a measure of adequacy of housing, involving considerations of crowding with the likelihood of infection and also the matter of sufficiency of income.

26. NUMBER OF CHANGES OF DOMICILE

It appears that in the past changing house may have been so easy to arrange in certain walks of life that frequency of removal is less significant than may be thought; however it is presumed to relate in large measure to stability of employment and income.

27. SOCIAL HARDSHIP IN CHILDHOOD

This criterion is based on questions 1) Whether patients had habitually run barefoot as children. 2) Whether they had ever had holidays as a family away from home in their youth, and 3) Whether their parents had a difficult time providing adequate food and clothing. Any one feature in this category is noted. The question of proper room heating in the home was originally included, but later abandoned owing to lack of referable standard.

28. POSITION IN FAMILY

The seniority index of the patient himself within the family is used as a social indicator of possible importance in view of divergences of experience likely between earlier and later members of a large family.

29. SIZE OF FAMILY

The number of sibs in the family is used as a measure of social circumstance. To be born into a large family as opposed to a small one may have great disadvantages but the advantages may be so distinct as to preponderate for those who survive to adult life, assuming always that work is available at reasonable distance for the multiple wage-earners in a large family.

SOCIAL STUDY RESULTS

1. FATHER'S SOCIAL CLASS

For men in all disability groups the younger members tend to come more often than expected from class IV and V, and the older men have been born into these groups less often than expected. Only in group I disability, is this trend of significance.

(X^2 = 6.76 df = 1 $P < 0.01$ in disability group I)
(X^2 = 2.62 df = 1 $P > .10$ in disability group II) (Table X a.)
(X^2 = .346 df = 1 $P > .50$ in disability group III)

When the contrast is between social classes I and II on the one hand, and III, IV and V on the other, significant age influences are again found, although in the greatest disability group it appears the association is of inverse character.

(X^2 = 4.174 df = 1 $P < 0.05$ in disability group I)
(X^2 = .066 df = 1 $P > .70$ in disability group II) (Table X c.)
(X^2 = 5.635 df = 1 $P < 0.02$ in disability group III)

No significance can be attributed to the relationship between father's social class and disability for either younger or older men when the demarcation is between classes IV and V, and the others.

(X^2 = 2.1 df = 2 $P > .30$ in younger ages)
(X^2 = .103 df = 1 $P > .70$ in older ages) (Table X b.)

However, when social classes I and II are distinguished from III, IV and V, among older men there is a significant association between greater degrees of disability and lowlier origins. For younger men no similar trend can be demonstrated.

(X^2 = .364 df = 1 P $>$.50 in younger ages)

(X^2 = 11.53 df = 2 P $<$0.01 in older ages) (Table X d.)

For women, relatively few individuals have origins in social class I or II yet it can be seen that no significant association exists between age and social class when class I and II contrasts with III, IV and V. Neither is disability itself related to class difference of this kind in the father. (Tables X a. and X b.) Similar conclusions are reached when the social class contrast is made between IV and V, and the others.

(X^2 = .959 df = 1 P $>$.30 in disability groups I and II)

(X^2 = .874 df = 1 P $>$.30 in disability group III) (Table X c.)

(All ages X^2 = 1.256 df = 2 P $>$.50) (Table X d.)

2. FATHER NOT IN REGULAR WORK

For men, a significant relationship between this factor and age is found only in intermediate disability group II, where fewer older men than expected claim a father unable to keep a job and conversely more younger men claim such a handicap in youth.

(X^2 = 0.35 df = 1 P $>$ .50 in disability group I)
(X^2 = 4.12 df = 1 P $<$ 0.05 in disability group II) (Table XI a.)
(X^2 = 2.93 df = 1 P $>$ 0.05 in disability group III)

For men of all ages summated, no significant relationship with reference to disability is demonstrated.

(X^2 = 4.090 df = 2 P $>$ 0.10 in all ages) (Table XI b.)

For women, this circumstance of early life bears no significance with regard to present age or to degree of disability.

(X^2 = 2.980 df = 1 P $>$ 0.05 in disability groups I and II)
(X^2 = .195 df = 1 P $>$ .50 in disability group III) (Table XI a.)

(In all ages X^2 = .274 df = 2 P $>$ .80) (Table XI b.)

3. MOTHER WORKED AFTER MARRIAGE

For men the influence of age is shown to be significant only in the least disability group I. Fewer older men than expected have had mothers regularly out to work and more young men make a similar claim. The same trend is seen throughout the other disability groups.

(X^2 = 3.92 df = 1 $P < 0.05$ in disability group I)
(X^2 = .09 df = 1 $P > .70$ in disability group II) (Table XII a.)
(X^2 = 1.4 df = 1 $P > .20$ in disability group III)

With reference to disability grading, no significant relationship is found with the numbers claiming working mothers.

(X^2 = 3.23 df = 2 $P > 0.10$ for all ages) (Table XII b.)

For women, no significant influence is traceable to age.

(X^2 = 2.283 df = 1 $P > .10$ in disability groups I and II)
(X^2 = 1.511 df = 1 $P > .20$ in disability group III) (Table XII a.)

Nor is there an appreciable association with disability when all ages are summated.

(X^2 = 1.551 df = 2 $P > .30$ in all ages) (Table XII b.)

4. PATIENT'S EDUCATIONAL STANDARD

For men, age alone exerts no influence in any of the disability groups.

($X^2 = 0.734$ df = 1 $P > .30$ in group I)

($X^2 = 2.068$ df = 1 $P > .10$ in group II) (Table XIII a.)

($X^2 = 0.630$ df = 1 $P > .30$ in group III)

However, when disability is considered a significant difference is noted. More men than expected have lesser educational backgrounds among the grossly disabled, and this is also the case in intermediate disability. Fewer men in least disability group I have lesser education and conversely more men than expected in this group have higher educational backgrounds.

($X^2 = 19.760$ df = 2 $P < 0.01$ in all ages) (Table XIII b.)

For women, the influence of age does not reach statistical significance

($X^2 = 0.074$ df = 1 $P > .70$ in disability groups I and II)

($X^2 = 0.066$ df = 1 $P > .70$ in disability group III) (Table XIII a.)

Significantly more grossly disabled women than expected have lesser degrees of educational attainment and conversely fewer women from disability groups I and II give a lesser educational history.

($X^2 = 15.295$ df = 2 $P < 0.01$) in all ages.) (Table XIII b.)

5. APPRECIABLE LOSS OF SCHOOLING

For men, a significant level of influence with reference to age is shown by this factor in disability group II. More younger men than expected have lost schooling and fewer older men have done so.

(X^2 = 1.14 df = 1 P $>$ .20 in disability group I)
(X^2 = 6.04 df = 1 P $<$ 0.02 in disability group II) (Table XIV a.)
(X^2 = 0.78 df = 1 P $>$ .30 in disability group III)

When disability is considered no significant relationship with loss of schooling can be detected.

(Younger men X^2 = .380 df = 1 P $>$ .50)
(Older men X^2 = 2.86 df = 2 P $>$ .20) (Table XIV b.)

For women, age exerts an appreciable influence only among the most disabled, fewer older women in this category than expected recording definite loss of schooling and conversely younger women similarly disabled admitting lost schooling.

(X^2 = .835 df = 1 P $>$ .30 in disability groups I and II)
(X^2 = 3.873 df = 1 P $<$ 0.05 in disability group III. (Table XIV a.)

Disability is not shown to have a significant association with loss of schooling.

(Younger women X^2 = 2.130 df = 1 P $>$ .10)
(Older women X^2 = .013 df = 1 P $>$ .90) (Table XIV b.)

6. STARTED WORK AFTER FIFTEEN YEARS OF AGE

For men, there is some evidence of a relationship of this feature with age but only in disability group II does it show significance. Older men report this factor less often and younger men more often than expected

($X^2 = 0.03$ df = 1 $P > .80$ in disability group I)

($X^2 = 4.69$ df = 1 $P < 0.05$ in disability group II) (Table XV a.)

($X^2 = 0.08$ df = 1 $P > .70$ in disability group III)

In regard to disability, although in younger men significance cannot be attributed, the numbers being small, for older men the influence of disability reaches a level of statistical significance.

Fewer older men from disability groups II and III than expected admit a late start to work and more than expected from disability group I claim a similar late start.

($X^2 = 1.064$ df=1 $P > .30$ for younger men)

($X^2 = 13.88$ df=2 $P < 0.01$ for older men) (Table XV b.)

For women no significant relationship is traced between age and a late start to regular work outside the home.

($X^2 = 1.042$ df=1 $P > .30$ in disability groups I and II)

($X^2 = 1.431$ df=1 $P > .20$ in disability group III) (Table XV a.)

Disability on the other hand exerts a significant influence. When all ages are summated it is found that fewer women than expected from disability group II and also from III report delay in commencing work and conversely more from group I than expected do so.

($X^2 = 6.991$ df=2 $P < 0.05$) (Table XV b.)

7. EXPOSURE TO DUST

For men, a claim to have been subjected to appreciable dust at their work has apparently no relationship to age.

(Disability group I X^2 = .11 df = 1 P $>$ .70).

(Disability group II X^2 = .97 df = 1 P $>$ .30). (Table XVI a.)

(Disability group III X^2 = .54 df = 1 P $>$ .30).

When the influence of disability is assessed apart from age, there is a significant relationship. More moderately disabled and severely disabled men than expected have a history of dust exposure and conversely fewer of the least disabled than expected do so.

(All ages X^2 = 7.59 df = 2 P $<$ 0.05). (Table XVI b.)

For women no significant relationship can be traced between age and the prevalence of a claim to past exposure to dusty conditions at work.

(Disability groups I and II X^2 = .192 df = 1 P $>$ .50).

(Disability Group III X^2 = .087 df = 1 P $>$ .70).(Table XVI a.)

Summating all ages for women, no significance can be adduced in considering the incidence of claims to dust experience at work with reference to degree of disability.

(X^2 = 4.28 df = 2 P $>$ .10). (Table XVI b.)

8. EXPOSURE TO DRAUGHTS

For men, it appears that only in group II disability may age be significantly related to experience of draughty conditions. Fewer younger men and more older men than expected admit this factor at work in all disability groups but no significance can be shown in groups I and III.

(X^2 = .439 df = 1 $P > .50$ in disability group I)

(X^2 = 4.52 df = 1 $P < 0.05$ in disability group II) (Table XVII a.)

(X^2 = .827 df = 1 $P > .30$ in disability group III)

When the influence of disability is assessed, no significant effect can be traced either in the younger or in the older age groups.

(Younger men X^2 = .507 df = 2 $P > .70$)

(Older men X^2 = .674 df = 2 $P > .70$) (Table XVII b.)

For women, there are too few individuals reporting draughts for the influence of age to be calculated.

When all ages are considered together, it is found that disability is not significantly related to a history of exposure to draughty conditions.

(X^2 = 1.332 df = 2 $P > .50$ for women in all ages) (Table XVII b.)

9. WET CONDITIONS AT WORK

For men, the influence of age is strong in disability group II but not to a significant extent in the other grades of disability.

(X^2 = 7.182 df = 1 P $<$0.01 in disability group II) (Table XVIII a.)

Fewer younger men and more older men than expected claim the effects of particularly wet conditions.

With regard to disability, no significance can be traced in its relation to wet conditions among younger men, but in the older age group significantly fewer men than expected with lesser disability and more men than expected with greater disability can claim a history of wet conditions.

(X^2 = 4.235 df = 2 P $>$ .10 in younger age group)
(X^2 = 7.748 df = 2 P $<$0.05 in older age group) (Table XVIII b.)

For women, the numbers do not allow an analysis of the influence of age. When disability itself is considered in relation to wet working conditions, no significance can be attributed for this factor.

(For women in all ages X^2 = 3.45 df = 2 P $>$.10) (Table XVIII b.)

10. EXTREMES OF TEMPERATURE

For men, no significant association can be demonstrated in any of the disability groups between age and working conditions entailing exposure to extreme contrasts of temperature at intervals during a spell of duty. Likewise when the influence of disability is analysed no significance can be traced for this factor.

(For men in all ages $X^2 = .831$ df = 2 $P > .50$) (Table XIX b.)

For women, the numbers are too few to allow an assessment either of the influence of age or in this instance of disability itself.

11. COLD CONDITIONS

For men, the influence of age is not significant in any of the disability groups, and when disability itself is considered, no significance is apparent in association with persistently cold conditions.

(For men in all ages $X^2 = 3.96$ df = 2 $P > .10$) (Table XX b.)

For women, age cannot be assessed alone owing to insufficient numbers. The influence of disability which can be traced is not strong enough to be significant in a statistical sense.

(For women in all ages $X^2 = 1.22$ df = 2 $P > .50$) (Table XX b.)

12. FUMES

For men a significant relationship between age and history of exposure to troublesome fumes cannot be demonstrated, perhaps owing to the paucity of numbers. When the influence of disability is analysed, no significance is apparent.

(All ages $X^2 = 3.277$ df = 2 $P > .10$) (Table XXI b.)

For women, the relationship of conditions of fume at work cannot be assessed with regard either to age or to disability since the numbers are too irregularly distributed.

13. INDOOR WORK

Whether predominantly indoor working conditions are contrasted with true outdoor conditions only or with all other types including the sizeable group of underground workers, for men the influence of age is not significant.

(X^2 = .095 df=1 P $>$.70 in disability group I)

(X^2 = .325 df=1 P $>$.50 in disability group II) (Table XXII a.)

(X^2 = .076 df=1 P $>$.70 in disability group III)

Nor can a significant relationship be established between disability and the proportions of men engaged predominantly in indoor as against outdoor work.

(X^2 = 3.492 df=2 P $>$.10 in all ages) (Table XXII d.)

Nevertheless, when the degree of disability is considered with reference to indoor work contrasting all other occupations, statistical significance is reached. Fewer men from disability groups II and III than expected work indoors and conversely more men from group I are predominantly indoor workers.

(X^2 = 10.05 df=2 P $<$0.01 for all ages) (Table XXII b.)

For women, the numbers of individuals engaged in employment other than predominantly indoor are rather small to allow straight comparison even between indoor and outdoor conditions. When indoor conditions are compared with all others no significance can be attributed to the influence either of age or of disability.

(X^2 = 1.028 df=1 P $>$.30 women all ages). (Table XXII b.)

14. OUTDOOR WORK

For men, contrasting outdoor employment with all other forms of work, a significant association with age is found in disability group II only. Fewer men from the older ages than expected have an outdoor work history, and correspondingly more younger men give a record of mainly outdoor conditions.

(X^2 = .09 df = 1 P $>$ .70 in disability group I)
(X^2 = 8.18 df = 1 P $<$ 0.01 in disability group II). (Table XXIII a.)
(X^2 = 2.60 df = 1 P $>$ 0.1 in disability group III)

When the influence of disability is assessed no significance can be attached to any differences between observed and expected numbers working outdoors for either younger or older age groups.

(Younger men X^2 = 1.8 df = 2 P $>$ 0.30)
(Older men X^2 = 4.99 df = 2 P $>$ 0.05) (Table XXIII b.)

For women the numbers are rather small to make conclusions. Neither age nor disability seem to relate to outdoor working conditions for women.

15. UNDERGROUND WORK

Very few men in the younger age group in this series have worked principally underground indeed in disability group I no analysis is possible because of lack of numbers.

The influence of age, apparently similar in disability groups I and II, can only be shown to be significant in group II. More older men and fewer younger men than expected have worked a major part of their working lives underground.

($X^2 = 13.38$. df = 1. $P < 0.01$. in disability group II after Yates correction)

($X^2 = 2.96$ df = 1 $P > 0.05$ in disability group III) (Table XXIV a.)

Among older men the influence of disability cannot be shown to be of significance either combining groups I and II for comparison with group III or in a straight comparison of groups II and III.

($X^2 = .149$ df = 1 $P > .90$ combined groups I and II contrasted with group III)

($X^2 = 3.68$ df = 1 $P > 0.05$ contrasting group II with group III) (Table XXIV b.)

Only a solitary woman, over 50 years of age and grossly disabled, has worked an appreciable part of her working days underground.

16. PATIENT'S OWN SOCIAL GRADING

For men, in none of the disability groups is there a significant association between age and social class.

(X^2 = 2.52 df = 2 P $>$0.20 in disability group I) (Table XXV e.)

(X^2 = .73 df = 1 P $>$0.30 in disability group II) (Table XXV a.)

(X^2 = 1.48 df = 1 P $>$0.20 in disability group III)

This analysis applies where social classes IV and V are contrasted with the others, and similar conclusions are reached when the contrast is between combined III, IV and V; and the others. (Table XXV c.)

No significant relationship can be traced between disability and patient's own highest social grading in any of the contrasts available from this series.

(X^2 = 1.117 df = 2 P $>$0.50 in all ages contrasting class IV + V with all others)

(X^2 = 5.497 df = 4 P $>$0.20 in older ages where contrast is possible between I + II, III, IV + V) (Table XXV b.)

(X^2 = .686 df = 1 P $>$.30 in younger ages,
X^2 = 2.605 df = 2 P $>$.20 in older ages; contrasting classes III + IV + V with the others) (Table XXV d.)

For women, except in disability group III, a significant association can be traced between age and social class, more older women and fewer younger women than expected belonging to classes I, II and III combined when contrasted with class IV and V.

16. PATIENT'S OWN SOCIAL GRADING (Continued)

($X^2 = 4.379$ df = 1 $P < 0.05$ in disability groups I + II)

($X^2 = 2.121$ df = 1 $P > 0.10$ in disability group III) (Table XXV a.)

However when the contrast is made between classes I and II combined, and the others no age influence is apparent.

($X^2 = 2.20$ df = 1 $P > .10$ in disability groups I + II)

($X^2 = 1.39$ df = 1 $P > .20$ in disability group III) (Table XXV c.)

Disability itself has no significant association with social class when assessed in various contrasts for women.

($X^2 = 1.945$ df = 2 $P > .30$ in younger age group) (Table XXV f.)

($X^2 = 2.341$ df = 1 $P > .10$ in older age group)

($X^2 = 2.00$ df = 2 $P > .30$ in all ages) (Table XXV b.)

(All the foregoing contrast classes IV + V with I, II and III)

($X^2 = .216$ df = 2 $P > .80$ in all ages for women, contrasting classes III, IV and V with the others) (Table XXV d.)

17. GREAT NUMBER OF CHANGES OF EMPLOYMENT

For men, there appears to be an association between present age and frequent changes of work. Although the trend is general it can be seen to register statistical significance only in disability group III, where more younger men and fewer older men than expected are floating employees.

(X^2 = 1.63 df = 1 P $>$ .20 in disability group I)
(X^2 = 1.63 df = 1 P $>$ .20 in disability group II) (Table XXVI a.)
(X^2 = 6.87 df = 1 P $<$ 0.01 in disability group III)

Disability alone cannot be shown to be associated with the occurrence of "rolling stones" in regard to work.

(X^2 = 1.107 df = 2 P $>$ 0.20 in younger age group)
(X^2 = 1.58 df = 2 P $>$ 0.30 in older age group) (Table XXVI b.)

For women, there is no significant relation to age in regard to this feature.

(X^2 = .086 df = 1 P $>$ .70 in disability groups I + II)
(X^2 = .371 df = 1 P $>$ .50 in disability group III) (Table XXVI a.)

Disability is shown to have no appreciable association for excessive numbers of change of job.

(X^2 = 2.867 df = 2 P $>$ .20 in all ages) (Table XXVI b.)

18. TRAVELLING IN SMOKING COMPARTMENTS HABITUALLY

For men, there is no apparent association in any of the disability groups between age and a distinct long-standing practice of travelling in "smoking compartments" in buses, trams or trains.

(X^2 = .05 df = 1 P $>$ .80 in disability group I)
(X^2 = 1.07 df = 1 P $>$ .30 in disability group II) (Table XXVII a.)
(X^2 = .145 df = 1 P $>$ .70 in disability group III)

Considering disability alone, no statistical relationship can be found with the practice of travelling in "smoking compartments".

(For men in all ages X^2 = .54 df = 2 P $>$ .70) (Table XXVII b.)

For women, no significance can be traced in relation to age changes.

(X^2 = .010 df = 1 P $>$ .90 in disability groups I + II)
(X^2 = .025 df = 1 P $>$ .80 in disability group III) (Table XXVII a.)

Likewise disability alone exhibits no apparent influence on the numbers admitting this practice.

(For women in all ages X^2 = 1.238 df = 2 P $>$ .50) (Table XXVII b.)

19. WIDE INTERESTS

For men, a significant association between width of outside interests and present age can be demonstrated only in disability group I. Fewer older men and more younger men than expected have a wide range of interests in all the disability groups but in groups II and III statistical significance is not reached.

(X^2 = 9.22 df = 1 $P < 0.01$ in disability group I)
(X^2 = 0.21 df = 1 $P > 0.50$ in disability group II) (Table XXVIII a.)
(X^2 = 0.01 df = 1 $P > 0.90$ in disability group III)

Assessing disability alone, no significance can be inferred among younger men, for any association with width of outside interests. However among older men, significantly fewer instances of wide outside interests than expected occur in disability group I and more than expected in disability groups II and III.

(Younger men X^2 = .703 df = 2 $P > .70$) (Table XXVIII b.)
(Older men X^2 = 11.695 df = 2 $P < 0.01$)

For women, significant relationships can be traced for width of interests neither with regard to age nor to disability.

(X^2 = .534 df = 1 $P > .30$ in disability group I) (Table XXVIII a.)
(X^2 = .044 df = 1 $P > .80$ in disability group II)
(X^2 = 2.076 df = 1 $P > .10$ in disability group III)

(For women in all ages X^2 = 2.334 df = 2 $P > .30$) (Table XXVIII b.)

20. AGE AT MARRIAGE

For men, age at marriage is not significantly related to present age in any of the disability groups except group I, where fewer older men and more younger men than expected have married early in life.

(X^2 = 12.206 df = 1 P $<$ 0.01 in disability group I)

(X^2 = 0.734 df = 2 P $>$ 0.50 in disability group II) (Table XXIX a.)

(X^2 = 0.223 df = 1 P $>$ 0.50 in disability group III)

The influence exerted by disability is significant for younger men only. It seems that marrying young is associated with the least disability, and marrying later with intermediate and greater disability. Among older aged men no such association is demonstrable.

(Younger men X^2 = 6.715 df = 2 P $<$ 0.05)

(Older men X^2 = 9.139 df = 6 P $>$ 0.10) (Table XXIX b.)

For women, the relationship of age at marriage with present age has statistical significance in the combined disability groups I and II but not in group III, although the trend is similar in all groups. As in the case of men, fewer of the older women and more of the younger women have married early than expected.

(X^2 = 11.433 df = 1 P $<$ 0.01 in disability groups I + II)

(X^2 = 1.487 df = 1 P $>$ 0.20 in disability group III) (Table XXIX a.)

The association of disability and age at marriage is significant neither for younger nor for older women.

(Younger women X^2 = 2.67 df = 2 P $>$ .20) (Table XXIX b.)

(Older women X^2 = 3.56 df = 1 P $>$ 0.05)

21. MARITAL STATUS

For men, there is a significant association between age and the married state in the least disability group only, where fewer younger men and more older men than expected are married.

(X^2 = 3.916 df = 1 $P < 0.05$ in disability group I)
(X^2 = 0.057 df = 1 $P > .80$ in disability group II) (Table XXX a.)
(X^2 = 0.013 df = 1 $P > .90$ in disability group III)

In the younger age group alone there appears to be a significant relation between disability and marriage, but this cannot be said of the older men.

More grossly and moderately disabled men are married and fewer less disabled men are married than expected.

(Younger men X^2 = 5.513 df = 1 $P < 0.02$) (Table XXX b.)
(Older men X^2 = 3.476 df = 1 $P > 0.05$)

For women, no significance attaches to age in any of the disability groups when considered with relation to the marital state. (Table XXX a.) Disability in itself does show a significant relationship to marital status when all ages are summated. Thus for women it seems there is an association between the unmarried state and the grosser degrees of disability and more married women than expected are found in the least disability group.

(For women all ages X^2 = 10.405 df = 2 $P < 0.01$) (Table XXX b.)

22. HOUSING. NUMBER OF ROOMS OCCUPIED

For men, no significant relation can be found between present age and the number of rooms occupied, on average over a lifetime.

(X^2 = .646 df = 2 P $>$ .30 in disability group I)
(X^2 = .021 df = 1 P $>$ .80 in disability group II) (Table XXXI a.)
(X^2 = 1.002 df = 1 P $>$ .30 in disability group III)

The influence of disability itself shows significance. Fewer men than expected in the least disability group and more men than expected in the intermediate and severe disability groups have lived in small houses on the average and conversely for large houses.

(For men in all ages X^2 = 10.507 df = 2 P $<$ 0.01) (Table XXXI b.)

For women, there is no significant association between age and size of house occupied on the average over the years.

(X^2 = 1.080 df = 1 P $>$ .20 in disability groups I + II)
(X^2 = 0.052 df = 1 P $>$ .80 in disability group III) (Table XXXI a.)

For women, disability is not significantly related to average number of rooms inhabited.

(For men in all ages X^2 = 1.179 df = 2 P $>$ .50) (Table XXXI b.)

23. NUMBER OF INDIVIDUALS IN HOUSEHOLD

For men, any relation between present age and the average number of individuals in the house is found not to be significant.

(X^2 = 3.317 df = 2 P $>$ .10 in disability group I)
(X^2 = 4.017 df = 2 P $>$ .10 in disability group II) (Table XXXII a.)
(X^2 = 2.503 df = 2 P $>$ .20 in disability group III)

Disability in itself bears no significant relation to the size of domestic household expressed as an average over the years.

(For men in all ages X^2 = 8.04 df = 4 P $>$ 0.05) (Table XXXII b.)

For women, there is no significant association between age and the average size of household.

(X^2 = 1.339 df = 2 P $>$ .50 in disability groups I + II)
(X^2 = 2.951 df = 2 P $>$ .20 in disability group III) (Table XXXII a.)

The influence of disability alone shows no significance in relation to the average number of individuals in the household.

(For women in all ages X^2 = 2,352 df = 4 P $>$ .50) (Table XXXII b.)

24. INSANITARY HOUSING

For men, age exerts a significant influence in regard to this factor in disability group III only. That is, in the severely disabled category more younger men and fewer older men than expected have been subject to insanitary housing conditions. A similar trend for men in disability groups I and II falls short of statistical significance.

(X^2 = .263 df = 1 $P > .10$ in disability group I)

(X^2 = 3.823 df = 1 $P > 0.05$ in disability group II) (Table XXXIII a.)

(X^2 = 4.656 df = 1 $P < 0.05$ in disability group III)

In neither of the age groups can disability alone be shown to have a significant association with insanitary housing.

(Younger men X^2 = 2.57 df = 2 $P > .20$) (Table XXXIII b.)

(Older men X^2 = .016 df = 2 $P > .99$)

For women, there is some evidence of association between age and insanitary housing. Younger women have experienced insanitary housing more frequently and older women less frequently than expected in combined disability groups I and II. A similar trend for women in disability group III does not reach a significant level.

(X^2 = 9.823 df = 1 $P < 0.01$ in disability groups I + II)

(X^2 = 3.453 df = 1 $P > 0.05$ in disability group III) (Table XXXIII a.)

Disability alone has no significant association with insanitary housing.

(Younger women X^2 = .888 df = 2 $P > .50$) (Table XXXIII b.)

(Older women X^2 = 1.602 df = 1 $P > .20$).

25. RATIO OF PERSONS TO ROOMS IN HOUSEHOLD

For men, there is no apparent association between present age and the ratio calculated from the average experience over a lifetime.

(X^2 = 3.107 df = 2 P $>$ .20 in disability group I)
(X^2 = 3.008 df = 2 P $>$ .20 in disability group II) (Table XXXIV a.)
(X^2 = 2.473 df = 2 P $>$ .20 in disability group III)

When age groups are summated no significance can be attached to disability alone with reference to the ratio of number of persons to number of rooms occupied.

(For men in all ages X^2 = 9.356 df = 4 P $>$ 0.05) (Table XXXIV b.)

For women, similar results are obtained. When age is considered, no significant influence on the ratio of persons to rooms can be seen.

(X^2 = 5.957 df = 2 P $>$ 0.05 in disability groups I + II)
(X^2 = 4.444 df = 2 P $>$ 0.10 in disability group III) (Table XXXIV a.)

Again assessing disability alone for women no significance can be attributed to its relationship with this ratio of persons to rooms in household. (Table XXXIV b.)

It is pertinent to observe in this connection that the ratios coded 1-3 correspond to greater degrees of crowding than two persons per room.

26. NUMBER OF CHANGES OF DOMICILE

For men, significance is evident with regard to age in disability groups I and II but not in group III. More older men and fewer younger men than expected have experienced a large number of changes and conversely for small numbers of moves.

(X^2 = 7.989 df = 2 $P < 0.02$ in disability group I)
(Table XXXV a.)
(X^2 = 10.107 df = 2 $P < 0.01$ in disability group II)
(X^2 = 4.722 df = 2 $P > 0.05$ in disability group III)

When disability is assessed against frequency of removal no significance is evident in either of the age groups.

(Younger men X^2 = 4.449 df = 4 $P > .30$) (Table XXXV b.)
(Older men X^2 = 5.515 df = 6 $P > .30$)

For women, there is again a significant relationship between age and number of changes of domicile. More older women and fewer younger women have removed a large number of times and conversely.

(X^2 = 9.577 df = 2 $P < 0.01$ in disability groups I + II)
(Table XXXV a.)
(X^2 = 9.119 df = 2 $P < 0.02$ in disability group III)

However, disability itself shows no significant association with frequency of removal, in either age group.

(Younger women X^2 = 1.281 df = 2 $P > .50$) (Table XXXV b.)
(Older women X^2 = 0.080 df = 2 $P > .95$)

27. CONDITIONS OF SOCIAL HARDSHIP IN CHILDHOOD

For men, no significant relationship exists between age and hardship of the listed type.

(X^2 = .132 df = 1 P $>$ .70 in disability group I)
(Table XXXVI a.)
(X^2 = 1.010 df = 1 P $>$ .30 in disability group II)
(X^2 = .080 df = 1 P $>$ .70 in disability group III)

There is a significant association between disability and previous experience of social hardship of this type in childhood. More men from disability groups II and III and fewer men from group I than expected have suffered such deficiencies in parental care.

(For men in all ages X^2 = 8.419 df = 2 P $<$ 0.02) (Table XXXVI b.)

For women, no significant relation is found between age and these criteria of hardship in childhood.

(X^2 = .508 df = 1 P $>$ .30 in disability groups I + II)
(Table XXXVI a.)
(X^2 = .038 df = 1 P $>$ .98 in disability group III)

Considering disability alone in relation to necessitous conditions in childhood, statistical significance is not forthcoming.

(For women in all ages X^2 = .918 df = 2 P $>$ .50) (Table XXXVI b.)

28. POSITION IN FAMILY

For men, it is found that there is no significant relationship between age and the seniority index within the family.

(X^2 = a tiny fraction df = 1 in disability group I)
(X^2 = .499 df = 1 P $>$ .30 in disability group II) (Table XXXVII a.)
(X^2 = 2.776 df = 1 P $>$ .20 in disability group III)

No significance can be attributed to disability alone in relation to seniority index.

(For men in all ages X^2 = 4.060 df = 4 P $>$ .30) (Table XXXVII b.)

For women, similar negative findings must be recorded regarding the influence of age.

(X^2 = 1.356 df = 2 P $>$ .50 in disability groups I + II)
(X^2 = .311 df = 2 P $>$ .50 in disability group III) (Table XXXVII a.)

Disability alone exerts no significant influence on seniority index for women.

(For women in all ages X^2 = 1.573 df = 4 P $>$ .80) (Table XXXVII b.)

29. SIZE OF FAMILY

For men, the relationship of present age and size of family is significant in disability group II, older men coming from small families less often and large families more often than expected and conversely for younger men.

Significance is not proved for the men of other grades of disability however.

(X^2 = 2.634 df = 2 P $>$ .20 in disability group I)
(Table XXXVIII a.)
(X^2 = 20.695 df = 2 P $<$ 0.01 in disability group II)
(X^2 = .322 df = 2 P $>$ .80 in disability group III)

Disability itself cannot be shown to bear a significant relation to the size of family the parents produced, in the case of men.

(Younger men X^2 = 6.615 df = 4 P $>$ .10) (Table XXXVIII b.)
(Older men X^2 = 4.706 df = 4 P $>$ .30)

For women, there is an entire absence of evidence as to significant relationships. For age the findings are negative in all disability groups.

(X^2 = 1.992 df = 2 P $>$ .30 in disability groups I + II)
(Table XXXVIII a.)
(X^2 = 4.118 df = 2 P $>$ .10 in disability group III)

No significance is shown when disability is considered with reference to number of sibs.

(For women in all ages X^2 = 4.450 df = 4 P $>$ .30)
(Table XXXVIII b.)

DISCUSSION

SOCIAL STUDY

Studies of Social Class associations have often been based on Standardised Mortality Ratios and Proportionate Mortality Ratios; nevertheless in a number of population surveys a social gradient of chronic bronchitis prevalence has been established.

There is just as intense an association for married women whose allocation to social class depends on husband's occupation and this link can be traced on closer study of social classes III, IV and V. This strongly suggests in the words of the Report of the Sub-Committee of the Standing Medical Advisory Committee (Scottish Health Services Council 1963) that "the factors determining the excess of mortality from bronchitis are more likely to be environmental than occupational". It is perhaps too readily assumed that prevalence and mortality rates are closely parallel.

Ogilvie and Newell (1957) demonstrate a social gradient for men; and Brown et al. (1957) find the association is only apparent among smokers whereas the College of General Practitioners survey (1961) while confirming the social gradient find smoking habit differences too small to explain it. As to causes for social class variations, air pollution and overcrowding have been suggested but correlation between regional death rates and overcrowding have not been forthcoming (Fairbairn and Reid 1958).

In the present series, father's social class is not associated with disability for women nor for men, except when comparing social classes I and II with the others in the older age group. Nor is there any relation with disability when patient's own social class is considered for either sex. Since the recorded social grade has been based on each patient's established status and not on his most recent earning capacity, it is perhaps less remarkable that Meadows' (1961) finding of a drift down the social scale with increasing disability is not mirrored by this series. It may be fair to conclude that social class changes are a consequence rather than a cause of disability due to chronic bronchitis.

For this series of bronchitics, no association between disability and a working mother or a father not in regular employment can be traced for either sex. In terms of loss of schooling also there is no significant relation to disability. These findings seem to tie up with the general impression of the paediatricians that the majority of childhood catarrhal conditions clear up by adult ages and have little bearing on the bronchitis problem for the adult. Starting work later than average, in the present series is associated for women and older men with the least disability and the observation is therefore probably more suitably attributed to different educational standards. When this factor is analysed it is apparent that a significant association is present for both sexes between disability and poorer education.

No significant association between disability and either underground work or outside work is apparent in the present series, but it may well be the case as surmised by Ogilvie and Newell that men may have changed employment, the overall working conditions being recorded giving a mixture of cause and effect in this context once more. For men only, a significant relation is demonstrated with regard to indoor work contrasting all others, outdoor + underground being associated with disability and indoor work with little or none.

The employment "wanderer" who lacks steady work in this series shows no special propensity for severe disability in either sex.

OCCUPATION

Among Howell's small group of patients, occupation seems relatively unimportant as a possible causative factor. The majority are indoor workers - 77%; exposure to dust being claimed in 40% overall but included in these are some window cleaners, clerks and housewives. In the study of Ogilvie and Newell occupational history is not significantly associated with bronchitis in the cases of "wanderers" meaning people who have not held the same type of work for at least half their life-time. They find no especial association with any one type of work in the case of those who have been in stable employment although three groups seem less prone to bronchitis, to wit - administrative, professional, clerk and typists. Amongst men the association is rather with social class, there being an excess of social Class V and a deficit of Classes I and II. For women the relative immunity of clerical and typing compares with the high rate in housewives, a difference which is largely attributed to age differences. In only 3 instances did women report out-door work. The social class influence is similar to that of men but not to a statistical degree of significance. In the case of men, bronchitis is related significantly to the number of years of unemployment suffered in the past although in women there is no such association. This seems to point to the conclusion that it is an economic rather than a truly occupational factor which is thus expressed.

Stuart-Harris and Hanley (1957) consider occupation to be a compound of social and working conditions, and the latter they classify in three grades of heaviness and three of dustiness. For the industrial community the proportions of men suffering group E and G symptoms are the same in clean non-dusty work and in heavy work at the time of the survey. When past work history is considered for those who have spent at least $\frac{2}{3}$ of their working life in the same type of job, there is an excess of group G symptoms in association with dusty as compared with clean work. On the other hand among ex-miners only a slight excess of group G symptoms occurs.

The incidence of group G symptoms is higher among ex-farm workers than among those in work as clean but less heavy. Remarkably little difference exists between the occurrence of group G symptoms in heavy industrial workers and in farmers. Some 30% of farmers admit cough and tightness after handling dusty hay.

By contrast, apart from social class differences Ogilvie and Newell (1957) find heaviness of work which they have graded into heavy, active, light and sedentary, bears no relation to the occurrence of bronchitis in their random samples in Newcastle upon Tyne. An apparent association with heavy work disappears when social class is taken into account.

WORKING CONDITIONS

Outdoors

In the Ogilvie series, of those in the same work for two thirds of their life, between the bronchitics and the controls there is no difference in the proportions of outside workers (about two fifths). For those in the same work at least half a lifetime, significantly more outdoor and underground workers occur among bronchitics than among controls.

It is suggested that between the half and two thirds stage an appreciable number of bronchitics are forced to leave their regular work outdoors and seek the shelter of indoor conditions.

Of Howell's (1951) series only 23% worked outdoors and then not badly exposed to the weather.

Draughts

In the Ogilvie series, among bronchitics significantly more instances of draughty conditions are reported than among controls, when the one job - half life time men are considered.

Extremes of Temperature, Dust and Fumes

A definite association is demonstrated between bronchitis and extremes of temperature, dust at work, and fumes although in the case of the latter there is no statistical significance.

Dampness on the other hand, bears no relation to bronchitis in their men. For their "wanderers", only extremes of temperature has any significant association with bronchitis.

For women these uncomfortable working conditions are seldom mentioned and are evenly distributed between bronchitics and controls.

RELATION TO WEATHER AND ATMOSPHERIC CONDITIONS

Out of his 1000 bronchitics Oswald finds the majority dislike the winter season by far the most frequently; and conditions of fog, and wet almost equally, with cold a good third, a change of temperature from hot to cold being much more harmful than from cold to hot. The complaint about wet conditions seems to indicate dislike of persistent dampness rather than actual rain.

In his study of factors which in the opinion of the patients are important in the causation of exacerbations of cough, or conversely in diminishing cough; in bringing on dyspnoea or worsening dyspnoea, and factors precipitating colds, Howell stresses the great importance of cold weather, draughts, wet, fogs, and smoke; yet curiously few consider smoking important and physical exertion features as a strong influence.

The locality of residence has been studied by Ogilvie and Newell and they find an association between bronchitis and "enclosed" sites i.e. those where houses are hemmed in, and significantly more bronchitics than controls are domiciled in areas associated with fog, damp and soot and conversely less in areas described as relatively "clear".

The prevalence figures for the three main city areas of Newcastle-upon-Tyne suggest a definite relationship between bronchitis and the riverside industrial context, which means atmospheric pollution.

Exposure to dust which has repeatedly been shown to result in a substantial excess in the prevalence of chronic bronchitis in industry compared with farming and allied occupations (Higgins and Higgins et al. 1956 to 1961), in this series is significantly associated with disability for men but not for women.

However, draughts, extremes of temperature cold and fumes are not significantly related to disability in this series for either sex. In the Ogilvie survey significance is related to the incidence of bronchitis. For younger men and all women there is no association in the present series with wet conditions of work, but for older men disability has a significant relation to this factor.

Enquiry of this sort is fraught with great difficulty depending as it must on the patient's subjective impressions, especially in the case of "cold" "draughts" and "fumes". It does not appear that among the most disabled of these patients there has been any gross tendency to exaggerate uncomfortable working conditions.

The habit of travelling in closed compartments with smokers is not related to disability in this series of patients. This is not altogether surprising when as will be seen later a relation between disability and the amount of tobacco smoked is difficult or impossible to demonstrate.

Only in the older men can an association be shown between width of outside interests and disability, and in this instance one must suppose that the more experienced men with more time on their hands tend to employ it in a greater variety of ways although there is no doubt that by keeping carefully indoors all winter and not exposing himself more than necessary the bronchitic can avoid infection and maintain a reasonable standard of wellbeing.

HOUSING

In the survey of Ogilvie and Newell in Newcastle on Tyne (1957), a distinction is drawn between a calculated "composite" house for those who have not occupied the same house for half a lifetime, and a "selected" house for those who have done so.

No associations are apparent in "selected" cases but the numbers are small, totalling only one third of the sample.

Significantly more bronchitic men than controls occupy small houses of 1, 2 or 3 rooms in the "composite" group, but it is not so for women. For neither sex is there any association between bronchitis and the number of persons in the household. Considering number of persons per room, there are consistently more bronchitic men than controls per room, but again this does not apply for women.

Overcrowding itself shows no significant relationship with bronchitis. No evidence of a predilection for bronchitis to occur especially in some household groups than in others has been found.

Dampness

A significant association exists between bronchitis and dampness in the "composite house", and among "selected" houses both bronchitis and controls report this circumstance at a high level, approximating that of the composite case. This is attributed to the greater number of old buildings in this group.

In the present series it may be safely assumed that the great majority of older working class people will have had a high risk of older property with dampness at some time in their experience. It has been found that only if this is gross will it have been reported.

In regard to housing, in this series of bronchitics significant associations between disability and insanitary housing, number of individuals in the household and ratio of persons to rooms occupied, and indeed overcrowding itself, are not forthcoming for either sex. Only for men does the number of rooms occupied relate significantly to disability, the smaller the house the greater the disability. No relation between the number of changes of domicile and present disability can be traced. It will be noted that the finding as to persons per room seems to conflict with the Newcastle survey for men but in that investigation the comparisons are between bronchitics and controls. There also importance is attributed to the number of rooms occupied, in distinction from the number of individuals. It appears that the economic status rather than the degree of crowding may be the basic factor of significance. In neither the Newcastle nor the present survey is overcrowding related to the incidence of bronchitis or disability due to that condition.

The relative importance of age at marriage in association with disability is evident only for younger men in this series, not for older men or for women. It seems this may constitute a result of disability rather than a contributory cause since later marriage is related to severer disability to a significant extent.

As to the married state itself, disability is significantly associated for younger men with marriage but for women the association is between the single state and disability. Presumably different causative factors operate in the two sexes giving this divergence of relationship. Perhaps economic necessity can be blamed for men working on till disability builds up, whereas young women with mild disability on the whole may be expected to keep a more sheltered life and stabilise better. The smoking habits of the two sexes doubtless are an overriding influence.

Social hardship in childhood, in this series constitutes no significant influence for women, but for the men there is an association between disability and the state of necessity during childhood.

It is difficult to avoid the feeling that this may be a fortuitous result, depending as it does on relative values when it is found that neither the position in the family nor the size of family, both of which are solid objective facts, bear any relation to disability for either sex.

MEDICAL HISTORY INCLUDING TOBACCO AND ALCOHOL CONSUMPTION

1. DAILY MAXIMUM NUMBER OF CIGARETTES CONSUMED

For this study the assessment against age and disability is based on the "usual maximum" number of cigarettes smoked each day. It is noted that whereas the bronchitic with slight or moderate disability may be smoking still at his maximum level, in severe disability many patients have been forced to reduce their consumption or to stop smoking altogether. This is a circumstance recorded by workers in the epidemiological field and in bronchitic surveys and probably vitiates conclusions about the effect of smoking habits in badly disabled patients. Accordingly the maximum level maintained over an appreciable period of time must constitute a more reliable index of bronchial irritation from tobacco smoke.

Ex-smokers are treated as a separate group and again in various combinations with present smokers and lifelong non-smokers.

2. AGE AT START OF SMOKING

This study has been included in order to test if very early experience of tobacco smoking in the form of cigarettes may be peculiarly harmful with regard to bronchitis later in life.

3. NUMBER OF YEARS A SMOKER OF CIGARETTES

Cognizance of other forms of tobacco habit has been taken, in this area notably pipe smoking and chewing but the numbers in each group being inadequate the final analysis has been restricted to a consideration of cigarette smoking. Cigar smoking likewise is

3. NUMBER OF YEARS A SMOKER OF CIGARETTES (Continued)

hardly ever reported. If tobacco is an aggravating influence on chronic bronchitis apart from any role it may play in initiating the process, then a close tie up may be expected with the duration of the smoking habit. The quantity smoked and the duration are doubtless different aspects of the influence of tobacco smoke on the bronchi. It is conceivable that any smoking beyond a small insignificant level may be just as harmful as heavy smoking in the context of chronic bronchitis, given sufficient duration.

4. REGULAR CONSUMER OF ALCOHOL

The regular consumer in this connection includes the drinker who has, say one night's drinking each week, in addition to those who are more frequent in their resort to the bottle. The occasional drinker for this purpose, on the other hand is one who can claim less frequency than weekly although each session may be heavy. The intention is to distinguish according to frequency of drinking rather than according to the quantity consumed.

5. QUANTITY OF ALCOHOL CONSUMED

After careful enquiry it has been possible to allocate each patient to a place on the scale: 1. abstainers; 2. light drinkers; 3. moderate drinkers; 4. avowedly heavy drinkers.

Some variation in personal standards in different parts of the community may account for a degree of confusion between the numbers for 3. and 4. but in practice it does not appear to be an important

5. QUANTITY OF ALCOHOL CONSUMED (Continued)

influence. In point of fact, owing to lack of numbers some fusing of categories has been necessary.

6. DRINKS BEER AND STOUT MAINLY

An attempt has been made to relate the principal beverage consumed to age and disability groupings, since drinking preferences may be worthy of enquiry as a factor distinct from alcoholism itself.

7. SPIRIT DRINKER

In the context of chronic bronchitis, a preference for spirits may be an important factor justifying enquiry, bearing as it will on the whole question of resistance to disease especially resistance to infection.

MEDICAL HISTORY INCLUDING TOBACCO AND ALCOHOL CONSUMPTION

1. DAILY MAXIMUM NUMBER OF CIGARETTES CONSUMED

For men there is no significant association between age and daily tobacco consumption in the form of cigarettes when reckoned at the maximum level, either including or excluding those who have given up the habit.

(Excluding ex-smokers $X^2 = 1.058$ df = 2 $P > .50$ in disability group I)
$X^2 = 2.222$ df = 2 $P > .30$ in disability group II)
$X^2 = 2.505$ df = 1 $P > .10$ in disability group III)
(Including ex-smokers $X^2 = 0.340$ df = 2 $P > .80$ in group I)
$X^2 = 0.652$ df = 2 $P > .70$ in group II)
$X^2 = 3.582$ df = 2 $P > .10$ in group III)

(Tables XXXIX a. and c.)

Contrasting non-smokers with smokers, too few individuals occur in the first category to allow proper statistical study with regard to the influence of age when ex-smokers are excluded (Table XXXIX i.) or included (Table XXXIX g.) but no significance is traced. When previous smokers are added to non-smokers and contrasted with present smokers, no association between age and the cigarette habit can be inferred (Table XXXIX e.).

Considering all ages together there is no significant association between disability and maximum level of cigarette consumption, no matter in which manner the contrasts are made.

(Excluding ex-smokers and non-smokers $X^2 = 0.685$ df = 4 $P > .95$)
(Table xxxix b.)

(Excluding only the ex-smokers $X^2 = 1.416$ df = 6 $P > .95$)
(Table xxxix 1.)

(Including ex-smokers and non-smokers $X^2 = 1.367$ df = 6 $P > .95$)
(Table xxxix d.)

(Including ex-smokers, excluding non-smokers $X^2 = 0.649$ df = 4 $P > .95$)
(Table xxxix k.)

The relationship of disability to the smoking of cigarettes to any number daily contrasted with absence of the habit has been studied. When the contrast is between those who have never smoked with those who have at any time done so, there is no significant association.

($X^2 = 0.410$ df = 2 $P > .80$ all ages) (Table XXXIX h.)

Likewise, no significance accrues when contrasting present smokers only with lifetime non-smokers.

($X^2 = 0.656$ df = 2 $P > .70$ all ages) (Table XXIX j.)

When previous smokers are reckoned with lifetime non-smokers contrasting present smokers, there is a statistical relationship. (Table XXXIX f.)

More men from lesser and intermediate disability groups than expected and conversely fewer from the gross disability group, are presently smokers, whereas, fewer than expected from the lesser degrees of disability are non-smokers or have given up the habit, and conversely more men from the greatest disability group are in this category.

($X^2 = 9.997$ df = 2 $P < 0.01$)

For women, the numbers are inadequate in some groups. Nevertheless, age is shown to exert an influence, significantly fewer younger women and more older women than expected being heavy smokers, and conversely, more younger women and fewer older women than expected being light smokers, in lesser disability only.

(Excluding ex-smokers ($X^2 = 5.574$ df = 1 P. $< .02$) in groups I + II

(Table XXXIX a.)

(Including ex-smokers $X^2 = 7.893$ df = 1 P. < 0.01 in groups I + II)

$X^2 = 2.417$ df = 1 P. $> .10$ in group III)

(Table XXXIX c.)

Contrasts between non-smokers and smokers for women show highly significant age differences. Fewer younger and more older women are non-smokers and more younger women and fewer older women than expected are smokers. (Table XXXIX g. and XXXIX i.)

(Including ex-smokers $X^2 = 22.321$ df = 1 P < 0.01 in disability gp. 1 + II

$X^2 = 5.364$ df = 1 P < 0.05 in disability Group III)

(Excluding ex-smokers $X^2 = 23.81$ df = 1 P < 0.01 in disability gp. 1 + II

When previous smokers are added to non-smokers and contrasted with present smokers, again there is significance in a similar type of association. (Table XXXIX e.)

$X^2 = 18.142$ df = 1 P < 0.01 in disability gp. I + II

A significant relationship can be established between disability and tobacco consumption as follows:

When ex-smokers are included, more non-smokers fewer light smokers and more heavy smokers than expected are found among grossly disabled women of younger age group. Although the least disabled show a similar trend, in intermediate disability are found fewer non-smokers more light smokers and fewer heavy smokers than expected.

(X^2 = 84.289 df = 4 $P < 0.01$ for younger age group) (Table XXXIX d.)

When ex-smokers are included but non-smokers left out, disability shows no association with cigarette consumption, except for apparent significance when distinguishing heavy from light smokers at 20 rather than 15 cigarettes daily.

(X^2 = 2.605 df = 2 $P > .20$ for younger ages) division of light from
(X^2 = 0.534 df = 1 $P > .30$ for older ages) heavy being 15 daily.
(X^2 = 4.118 df = 1 $P < 0.05$ for younger ages, when distinction is at 20 cigarettes daily)
(Table XXXIX k.)

More grossly disabled women than expected smoke heavily, also more lesser disabled women smoke lightly and conversely fewer grossly disabled women smoke lightly and fewer lesser disabled women smoke heavily.

When ex-smokers and non-smokers are omitted, no significance can be attributed in considering the relation of disability to number of cigarettes. (X^2 = df = 1 $P > .10$ in younger age group)

(Table XXXIX b.)

The relation of disability to smoking at all levels of cigarette consumption, when contrasted with no smoking habit, has been analysed for women.

When the contrast is between those who have never smoked with those who have at any time done so, there is no significant association.

(Table XXXIX h.) ($X^2 = 2.625$ df = 2 P .10 in younger age group)
($X^2 = .376$ df = 1 P .50 in older age group)

When contrasting present smokers only with lifetime non-smokers, again no significant relationship can be demonstrated.

(Table XXXIX j.) ($X^2 = 1.896$ df = 2 P .10 in younger age group)
($X^2 = 1.387$ df = 1 P .20 in older age group)

If previous smokers are reckoned with lifetime non-smokers contrasting present smokers, any relationship of disability for smoking cigarettes shows no statistical significance.

(Table XXXIX f.) ($X^2 = 2.321$ df = 2 P .30 in younger age group)
($X^2 = 1.550$ df = 1 P .20 in older age group)

2. AGE AT START OF SMOKING

For men, including ex-smokers present age seems significantly related to age at start of the smoking habit in disability group II but only marginally. Fewer younger men and more older men than expected have started the habit young. In each of the other disability groups no significance can be demonstrated.

(X^2 = 2.829 df = 1 $P > 0.05$ in disability group I)
(X^2 = 6.673 df = 2 $P < 0.05$ in disability group II) (Table XL a.)
(X^2 = 1.507 df = 1 $P > 0.20$ in disability group III)

Disability is not related to the age at which smoking is regularly begun, for men.

(Younger men X^2 = 3.316 df = 2 $P > .10$) (Table XL b.)
(Older men X^2 = 4.446 df = 2 $P > .10$)

For women, the numbers are too small to indicate clearly any effect of present age on the figures for commencement of smoking habit.

(X^2 = nil after Yates correction in disability groups I + II)
(Table XL a.)
(X^2 = 4.294 df = 1 $P < 0.05$ in disability group III)

Disability itself is not significantly linked to an early formation of the smoking habit in women.

(For women in all ages X^2 = 3.941 df = 2 $P > 0.01$)
(Table XL b.)

3. NUMBER OF YEARS A SMOKER OF CIGARETTES

For men, as may be anticipated, a very strong association exists between present age and the duration of the smoking habit in all disability groups. Fewer older men have shorter smoking histories, and fewer younger men have longer histories than expected, and conversely more older men have longer and more younger men have shorter histories than expected.

(X^2 = 35.11 df = 1 P $<$ 0.01 in disability group I) (Table XLI a.)
(X^2 = 28.52 df = 1 P $<$ 0.01 in disability group II)
(X^2 = 65.30 df = 1 P $<$ 0.01 in disability group III)

For the younger age group, no significant relationship exists between disability and duration of the smoking habit. For older men, however a significant link is established, more moderate and very long histories, and fewer short histories occurring than expected in disability group III with the converse in disability group I, whereas in disability group II more very long histories and fewer moderate and short histories than expected are recorded.

(Younger men X^2 = 7.731 df = 4 P $>$ 0.10) (Table XLI b.)
(Older men X^2 = 30.905 df = 4 P $<$ 0.01)

For women, the influence of present age is significant in combined disability groups I and II the effect being similar to that shown in men. No significance can be attributed in disability group III.

(X^2 = 17.52 df = 1 P $<$ 0.01 in disability groups I + II)
(Table XLI a.)
(X^2 = 1.42 df = 1 P $>$ 0.20 in disability group III)

3. NUMBER OF YEARS A SMOKER OF CIGARETTES (Continued)

Too few smokers exist in the older age group of women to test for significance but for younger women there is no significance in the relation of disability and duration of smoking habit.

(Younger women only $X^2 = 1.721$ df = 2 P $>$ .30) (Table XLI b.)

(Women in all ages $X^2 = 3.302$ df = 2 P $>$ .20)

4. ALCOHOL REGULAR CONSUMERS

For men, age has no significant association with the regularity or otherwise of alcohol consumption.

(X^2 = .017 df = 1 P $>$ .80 in disability group I) (Table XLII a.)
(X^2 = 1.554 df = 1 P $>$ .20 in disability group II)
(X^2 = 1.012 df = 1 P $>$ .30 in disability group III)

Any relation between disability itself and drinking regularity does not reach significant levels.

(For men in all ages X^2 = .940 df = 2 P $>$ .50) (Table XLII b.)

For the women in this series, a similar lack of statistical significance is apparent when regularity of alcohol consumption is considered in relation to age.

(X^2 = .022 df = 1 P $>$ .80 in disability groups I + II)
(Table XLII a.)
(X^2 = 1.038 df = 1 P $>$ .30 in disability group III)

Again when disability itself is assessed against regularity of drinking no significance can be demonstrated.

(For women in all ages X^2 = 1.348 df = 1 P $>$ .20)
(Table XLII b.)

5. ALCOHOL CONSUMPTION

For men, age is not a significant factor in the drinking habits reported in any of the disability groups.

(X^2 = 0.401 df = 3 P $>$ .90 in disability group I) (Table XLIII a.)

(X^2 = 0.837 df = 2 P $>$ .50 in disability group II)

(X^2 = 3.073 df = 2 P $>$ .20 in disability group III)

Furthermore, disability itself cannot be linked with alcoholic tendencies for men in all ages.

(For men in all ages X^2 = 3.253 df = 4 P $>$ .50) (Table XLIII b.)

For women, the relationship between present age and amount of alcohol regularly consumed is not shown to be significant.

(X^2 = 2.718 df = 2 P $>$ .20 in all disability groups combined (Table XLIII a.)

Likewise, no significance can be attached to disability in relation to amount of alcohol consumed for women.

(For women in all ages X^2 = 7.909 df = 4 P $>$ 0.05) (Table XLIII b.)

6. PREFERENCE FOR BEER AND STOUT

For men, age differences seem significant with reference to drinking preferences as expressed by the numbers usually taking beer and similar drinks.

The trend is similar in all disability groups, but significance can be demonstrated in disability groups I and II only.

(X^2 = 10.766 df = 1 P $<$ 0.01 in disability group I) (Table XLIV a.)

(X^2 = 4.055 df = 1 P $<$ 0.05 in disability group II)

More younger men and fewer older men favour beer, stout and lager than could be expected if age has no influence.

(X^2 = 1.502 df = 1 P $>$ .20 in disability group III)

There seems to be no significant difference in the drinking preferences of men according to degrees of disability, in either of the age groups.

(Younger men X^2 = 0.339 df = 2 P $>$ .80) (Table XLIV b.)

(Older men X^2 = 4.036 df = 2 P $>$ .10)

For women, no significant relation can be found between present age and the consumption of beer and stout.

(X^2 = 0.215 df = 1 P $>$ .50 in disability groups I + II) (Table XLIV a.)

(X^2 = nil after Yates correction in disability group III)

The influence of disability alone does not exhibit any significance in relation to preference for ale or lager in women.

(For women in all ages X^2 = 2.392 df = 1 P $>$ .10) (Table XLIV b.)

7. SPIRIT DRINKER

For men, there is no significant association between present age and the consistent drinking of spirits.

($X^2 = 1.243$ df = 1 P $>$ .20 in disability group I) (Table XLV a.)
($X^2 = 0.903$ df = 1 P $>$ .30 in disability group II)
($X^2 = 0.471$ df = 1 P $>$ .30 in disability group III)

Again there is no demonstrable relationship between disability itself and spirit drinking.

(For men in all ages $X^2 = 0.475$ df = 2 P $>$ .70) (Table XLV b.)

For women, the influence of present age on the numbers who drink spirits in each disability group shows no significance.

($X^2 = 0.051$ df = 1 P $>$ .80 in disability groups I + II) (Table XLV a.)
($X^2 = 3.209$ df = 1 P $>$ 0.05 in disability group III)

No appreciable association exists between disability and the practice of spirit drinking for the women in this series.

(For women in all ages $X^2 = 0.040$ df = 2 P $>$ .98) (Table XLV b.)

DISCUSSION

SMOKING

There is now a substantial body of evidence that tobacco consumption in the form of cigarette smoking has a close link with chronic bronchitis. In this connection it is essential to understand in advance what each other conceives as bronchitis in order that intelligent comparisons may be made.

Tobacco irritability has been considered an important factor causing bronchitis leading to emphysema by Abbott et al. (1953). The prevalence of chronic bronchitis is greater in smokers than in non-smokers among a group of male hospital patients according to Palmer (1954).

In patients smoking 20 cigarettes or more daily a very high prevalence of smoker's "bronchitis" has been demonstrated by Green and Berkowitz (1954). Oswald and Medvei (1955) report a higher prevalence of bronchitis in smokers of both sexes as compared with non-smokers in their study of sickness records from clerical civil service employees, the differences being greater among younger than older individuals.

Stuart-Harris and Hanley (1955) reporting a comparison of men from Wensleydale over 30 years of age with their industrial population, find an excess of heavy smokers (15 G. daily) over the expected numbers assuming that smoking has no influence, in both of their categories E and G, the difference being much greater in the rural than in the industrial population. The observed numbers of non-smokers are actually less than expected. A similar excess for cigarette smokers over non-smokers and pipe smokers occurs in E and G, but no such difference exists in the categories A, B and C which are outside the usual criteria for bronchitis. There is a much greater proportion in group E than in group G of moderate and heavy smokers compared with non-smokers, pipe smokers and ex-smokers. The relationship between smoking and persistent cough and sputum seems to be closer than that between smoking and chronic bronchitis as they define it.

In a series of bronchitics compared with a series of controls Loese (1956) finds the tobacco consumption higher. In a study of respiratory symptoms in heavy industry and men from a rural general practice, Clifton (1956) finds a close association between smoking and persistent cough and sputum. Again Phillips et al. (1956) trace a close correlation between smoking and chronic bronchitis. Preliminary standardization for smoking habits seems essential on this account if the influence of other factors is to be correctly assessed.

Studying mortality rates due to chronic bronchitis, Doll and Hill (1956) report a significant gradient from non-smokers to heavy smokers. In New England, Lowell et al. (1956) report smoking to be the major cause of "emphysema" between the ages of 50 and 81 years.

Ogilvie and Newell (1957) study chronic bronchitics and controls in a sample from the population of Newcastle-on-Tyne. They find for both sexes that bronchitics are heavier smokers than controls and for men there is a higher proportion of cigarette smokers among bronchitics than controls. No significant association between the number of cigarettes consumed and severity of the disease can be traced.

Among a thousand men in the age group 60 to 69 years Brown et al. (1957) in Birmingham trace chronic bronchitis more frequently in smokers than in non-smokers.

Higgins et al. (1956), Higgins (1957), Higgins and Cochran (1958) and Higgins (1959) in their studies on random samples at Leigh, Vale of Glamorgan, Annandale and the Rhondda Fach find that simple chronic bronchitis appears significantly more often in tobacco smokers than in non-smokers, that persistent cough and sputum has a significantly higher prevalence in smokers than in non-smokers, that chest illnesses breathlessness, wheeze and "chronic bronchitis" are more liable in smokers although statistically there is no significance. The changing proportion of men to women suffering from chronic bronchitis at various ages is attributed to the different smoking habits of women below the age of 45 years and above 45 years. Non-smokers with simple chronic bronchitis are shown to suffer no chest illness in three years, whereas in the same period heavy smokers with the same condition suffer chest illness in 17% of cases. The marked trend of increasing cough and sputum with increased tobacco consumption is not parallelled by a downward trend in maximum breathing capacity among smokers, although the maximum breathing capacity is reduced comparing smokers with non-smokers. Fletcher

et al. (1959) comparing postmen and female post office sorters find for both sexes a significant increase of cough and sputum with increasing tobacco consumption, only partly attributable to smoking habits, since symptoms increase with age among the men. No sex differences in symptom rates are evident among heavy smokers. Bronchitis is seldom seen in men who have never smoked. Compared with the findings of Higgins, differences in cough and sputum prevalence not explained by smoking habits entirely in the men, are attributed to atmospheric pollution and in the women the heavier smoking amongst post office employees is blamed.
The mean maximum breathing capacity is significantly higher for male non-smokers than for smokers and ex-smokers, but the differences between ex-smokers, light and heavy smokers are not significant.

John Fry (1960) reports that smoking is an important feature in each of his three groups of respiratory illness.

Olsen and Gilson (1960) report a strong influence of smoking on respiratory symptoms and consider the difference in bronchitis prevalence between England and Bornholm to be due to differences in smoking habits. The general prevalence of symptoms is significantly lower and the indirect maximum breathing capacity significantly higher in Rønne than in the United Kingdom. The difference is not explained by factors such as height and weight, density of population or atmospheric pollution. The non-smokers in each locality show no clinical difference.

A significant gradient of indirect maximum breathing capacity is demonstrated in Bornholm between pure cigarette smokers, pipe smokers and cigar smokers (but this does not apply to the Peak Flow rate).

The College of General Practitioners (1961) after a countrywide investigation assert that sex differences in chronic bronchitis are associated with differences in tobacco consumption, but significant differences in smoking habits are insufficient to explain the urban rural gradient in male morbidity. Likewise small differences in smoking habits between social grades are insufficient to explain the social gradient in bronchitis prevalence.

Fletcher and Tinker (1961) compare London Transport employees with London postmen using a questionnaire, classifying the cases according to smoking habits in relation to sputum volume, chest symptoms and ventilatory capacity (Peak Flow Rate). In each survey there is a similar relationship, smokers faring poorly compared with non-smokers and ex-smokers. Heavy smokers are worse off than light smokers in regard to persistent cough and sputum and one illness in three years, also more heavy than light smokers produce 2 ml. of morning sputum. At London Transport, smokers have lower Peak Flowrates than non-smokers and ex-smokers; however at the General Post Office non-smokers have comparatively low Peak Flow rates. Although between smokers and non-smokers there is generally a significant difference in frequency of respiratory symptoms, of chest illnesses and in level of ventilatory capacity, in all the surveys there has been a relatively small difference between heavier and lighter smokers. Two possible explanations are postulated, the one depending on appreciable numbers of severely affected individuals being forced to cut down their smoking and the other supposing that beyond a certain threshold the level of tobacco consumption influences the course of the condition little.

Read and Selby (1961) find lung function, measured by maximum expiratory flowrate suffers on the average an additional 2.23 litres per minute each year in association with the smoking habit as compared asymptomatic non-smokers. The incidence of symptoms does not differ significantly as between light, moderate and heavy smokers.

It will be observed that the influence of tobacco smoking on the occurrence of chronic bronchitis has been studied by two distinct methods. In the first the individuals in a community or several comparable communities are classified according to their smoking habits and are submitted to the symptomatic test for chronic bronchitis, studies of the incidence of symptoms being related to smoking practice. In the second method a group of bronchitics is contrasted with a control series of normal subjects, when tobacco consumption differences can readily be related to bronchitis.

In several surveys the total population studied is a group of hospital patients or a group selected from sickness records because of work lost through bronchial illness.

The work of Higgins and his associates in various parts of the country using random samples by similar methods have made it possible to pool the results and form a base line for other studies. The standardisation of methods has made comparison possible between different countries as in the work of Olsen and Gilson, the populations being similar apart from their smoking habits. This may be cited as a particularly neat piece of epidemiological investigation in that the two populations are as nearly equal as possible in every respect except the one to be measured.

It is noteworthy that no relation exists between severity of the disease and the number of cigarettes consumed in the study of Ogilvie and Newell, nevertheless here just as in other investigations heavier smoking is linked with bronchitis. Stuart-Harris and Hanley comparing observed numbers of non-smokers, heavy smokers etc. with the numbers to be expected if smoking has no influence, conclude there is a firm relationship between smoking and the earliest stage of simple bronchitis but that the influence of smoking on chronic bronchitis with disability is less distinct. The lack of distinct associations between levels of tobacco consumption and severity of symptoms has already been remarked in the work of Fletcher and Tinker, and of Read and Selby.

In the present series the findings in regard to smoking habit as an influence on disability do seem to support these comments, no appreciable effect being discerned for men except when those who at present smoke are contrasted with those who do not at present do so, the association being inverse so that disability is greatest in those who do not smoke and least in the heavier smokers.

For women the relationship is complicated by a strong age influence not found for men, younger women smoking on the whole less cigarettes than older women among whom there are more non-smokers. Significant associations occur between disability and smoking only in two comparisons for women. The first, for the younger ages gross disability is related to heavy smoking only when the critical level of consumption is 20 cigarettes daily; and the second, again for the younger women only being a composite relationship, gross disability being linked with both heavy smoking and non-smoking when the ex-smokers are included.

The numbers of ex-smokers especially among men are so considerable and the conclusions reached when they are included seem so remarkable, it must be concluded that the direct relationship between smoking and its consequences has been obscured in this series by changes of tobacco habit. It is conceivable that both of Fletcher's postulates may operate, since no association between degree of disability and tobacco consumption level can be traced and the numbers of former smokers seems greater than would be expected.

Generally tests of lung function show impairment in smokers as compared with non-smokers, in terms of indirect maximum breathing capacity or forced expiratory volume; and in several instances this also applies to the Peak Flow Rate (as in Read and Selby) although in one investigation (Olsen and Gilson) the latter test shows no significant trend.

Both the work of Fletcher and of Higgins record no gradient of indirect maximum breathing capacity with increasing tobacco consumption.

The age at which smoking commenced has no relation to disability for either sex in the present series. Ogilvie and Newell make a similar observation in their comparison of bronchitis with controls.

The number of years for which cigarettes have been smoked is significant for older men in the present survey in relation to disability. However there is no significant association for younger women and too few older women smoke to make an analysis possible. This would support the notion that very long years of smoking materially influences disability notwithstanding the apparent evidence regarding a threshold of cigarette consumption required to start the process.

From the data collected in this survey there is no clear evidence that any aspect of alcohol consumption is significantly related to disability from chronic bronchitis. Variation in the levels of consumption are not inconsiderable. Thus there seems no doubt that the conclusion reached is valid.

AIR POLLUTION VERSUS TOBACCO SMOKING

Ideally a field study of chronic bronchitis should permit subdivision into groups similar in all respects except one. Unless one can observe men doing identical work and can compare for example the prevalence of chronic bronchitis in smokers and non-smokers it is difficult to draw any certain conclusions on smoking alone.

Higgins and Cochran (1958) consider the pattern of respiratory symptoms pertaining to people aged 55 to 64 years in the unpolluted agricultural areas of Vale of Glamorgan and Annandale may be used as a base line for studies of the influence of occupation, urban environment and atmospheric pollution on bronchitis. In a comparison of a rural and an industrial sample of men aged 55 to 64 years with similar smoking habits, Higgins (1957) records more cough and sputum and fewer repeated chest illnesses or persistent sputum with chest illnesses in the country dwellers. His suggestion is that the effect of smoking has overshadowed the influence of air pollution.

In contrast Gregory (1955) gives the opinion that the influence of smoking is overshadowed by occupational factors. In this connection the findings of Higgins et al. (1956) as to bronchitis prevalence at Leigh are interesting. Social class differences cannot explain the twofold increase in bronchitis prevalence in miners as compared with non-miners. Miners with pneumoconiosis on the other hand show only a slightly increased prevalence above that seen in non-miners. Disability as measured by lung function tests, is

greater in miners without pneumoconiosis but with bronchitis than in simple pneumoconiotics. It is difficult to make firm assertions but smoking seems to play a part in this last finding. The difficulty in reaching conclusions which will be valid from such cross-comparisons is typical of the epidemiological survey instanced.
There seems no doubt that work underground at least, is related to a liability to chronic bronchitis in addition to respiratory symptoms and functional disability.

In order to establish the influence of atmospheric pollution it is difficult to plan a study in which the other factors of work and social conditions are eliminated. Reid (1956) in a survey of London postmen demonstrates area differences in bronchitis prevalence, the highest value being in the North East, which it is reasonable to suppose are to be linked with varying concentrations of smoke in the air of these districts.

Fletcher et al. (1959) make a comparison with the findings of Higgins in the case of their London postmen and groups from Stavely, Leigh and Vale of Glamorgan which is possible on account of the similarity of the criteria employed. The urban and rural differences are not obvious throughout since for women allowing for age, the Peak Flow Rate is almost identical in all areas in spite of the excess of all symptoms in the Londoners. This may be an effect of smoking. For men, ventilatory function as measured by mean M.B.C allowing for age, is the same in London postmen and the random sample of men in Leigh, but lower than in Stavely and Vale of Glamorgan.

The prevalence of cough and sputum is similar in all areas except Leigh where it is low, and the frequency of chest illness is the same in all three urban groups but low in the rural group of men. Smoking does not account for the differences in sputum production in the men. Considering chest illness frequency, the London postmen and urban men in Leigh show no differences, yet both London men and women have higher rates than their opposite numbers in the Vale of Glamorgan. It seems this is likely to be a true effect of urban residence.

Bignall (1961) thinks the difference in morbidity and mortality between town and country, but similarity in cough and sputum prevalence with similar smoking habits can be explained by the hypothesis that smoking rather than air pollution causes early persistent cough and sputum or in other words chronic bronchitis with disability follows when the pollution effect is added to bronchi already damaged by tobacco smoke.

Bronchitis sickness certificates have been used in assessing the importance of air pollution in the production of bronchitis morbidity, J.L. Burn (1960) tracing consistent increases in the number of such certificates with increase of pollution in two smog episodes in Salford.

Clifton et al. (1959) also using bronchitis sickness certificates reach similar conclusions.

Percy Stocks (1959) relates Standardised Mortality Ratios with measurements of atmospheric deposit and suspended matter (Smoke). After eliminating the effects of population density, highly significant correlations are found in the County Boroughs of England and Wales; and also in the case of deposit but not for smoke when all the areas of Lancashire and the West Riding of Yorkshire having the necessary pollution data, are compared. An associated rise in mortality rate from chronic bronchitis with the size of the community is seen also for lung cancer and pneumonia and this gradient for bronchitis is the steepest for both sexes and in all age groups.

The influence of air pollution is considered by Patrick Lawther (Recent Trends in Chronic Bronchitis 1958) to be the overriding factor but other possible etiological factors in urban life should not be forgotten. Social class implying housing, economic status, nutrition, medical care and convalescence, comes first followed by size of family, size of community and density of population. Occupational considerations including size of working group indoors smoking habits and climatic factors bring up the rear. Whether racial composition is important is not yet decided.

CHEST HISTORY

1. DURATION OF PERSONAL CHEST HISTORY

At a superficial estimate, the length of chest history is unlikely to correlate with severity of disability, since in some extreme cases irreparable damage seems to follow rapidly on a short term illness; yet in others of quite long standing and many separate exacerbations there is relatively slight permanent impairment of function. It has been considered worthwhile to carry out careful estimates of the true onset of appreciable chest symptoms in all cases in order subsequently to code the duration according to the number of years claimed and relate it to the present age and disability grading.

2. CHEST HISTORY IN PREVIOUS GENERATION

As a measure of similar living conditions and common biological inheritance of the patient and his forebears, this factor may be expected to show significant associations. Although failing to confirm bronchitic households, a high incidence of bronchitis among various relatives has been claimed in some English surveys.

(Stuart-Harris and Hanley 1958)

3. CHEST HISTORY IN SIBS

This is perhaps a truer estimate of the environmental bias of the formative years, although doubtless more recent living conditions will often play an important part when younger people have not yet left home.

4. PERSONAL HISTORY IN INFANCY

The accuracy for events as far back as infancy may well be queried, but the importance of the earliest months or years cannot be disputed despite the many cases where severe illness early in life seems to have no obvious bearing on the adult chronic bronchitis problem.

5. CHEST HISTORY IN CHILDHOOD

A history in childhood may be more accurately ascertained than can the foregoing and may be of very great interest in relation to later disability considering the number of cases which follow repeated bronchial illness during the school age into the teens. Yet it must be recognised that many such young people appear to make a recovery without severe impairment of breathing capacity.

1. DURATION OF CHEST HISTORY

For men, the present age has no significant relation to duration of personal chest history.

($X^2 = 5.628$ df = 2 $P > 0.05$ in disability group I)
(Table XLVI a.)
($X^2 = 6.367$ df = 3 $P > 0.05$ in disability group II)
($X^2 = 2.278$ df = 2 $P > 0.10$ in disability group III)

The influence of disability alone with all ages summated, is highly significant for men. More long histories and fewer short histories than expected occur in disability group III, with the converse more short and fewer long histories than expected in disability group I, whereas in disability group II similarity to group I at the lower end of the scale and to group III at the upper end produces more short histories and also more long histories than expected.

(For men in all ages $X^2 = 25.146$ df = 8 $P < 0.01$)
(Table XLVI b.)

For women, age again exerts no significant influence on duration of chest history.

($X^2 = 2.563$ df = 2 $P > .20$ in disability group I + II)
(Table XLVI a.)
($X^2 = 0.974$ df = 2 $P > .50$ in disability group III)

Disability itself shows significant association with duration of chest history for women, more long histories and fewer short histories being linked with severe disability while fewer long and more short histories are seen in lesser disability.

(For women in all ages $X^2 = 19.828$ df = 4 $P < 0.01$)
(Table XLVI b.)

2. HISTORY OF CHEST IN PREVIOUS GENERATION

For the men in this series, present age seems significantly related to a chest history in members of a previous generation, in disability groups I and II. Although a similar trend is seen in group III, no significance can be demonstrated.

More younger men and fewer older men than expected can remember such a history.

($X^2 = 12.090$ df = 1 $P < 0.01$ in disability group I)
(Table XLVII a.)
($X^2 = 6.004$ df = 1 $P < 0.02$ in disability group II)
($X^2 = 0.086$ df = 1 $P > 0.70$ in disability group III)

Disability itself with reference to chest history in a previous generation, attracts no statistical significance.

(Younger men $X^2 = 4.714$ df = 2 $P > 0.05$) (Table XLVII b.)
(Older men $X^2 = 1.696$ df = 2 $P > 0.30$)

For women, again a significant influence is exerted by age, fewer older women and more younger women than expected recalling such a history in a previous generation, in lesser degrees of disability. In disability group III again, a similar trend does not reach levels of significance.

($X^2 = 7.385$ df = 1 $P < 0.02$ in disability group I + II)
(Table XLVII a.)
($X^2 = 2.076$ df = 1 $P > 0.10$ in disability group III)

In neither age group can disability be shown to have a significant association with chest history in a previous generation.

(Younger women $X^2 = 0.955$ df = 1 $P > .30$) (Table XLVII b.)
(Older women $X^2 = 3.181$ df = 1 $P > 0.05$)

3. CHEST HISTORY IN SIBS

For men, there is no significance in the relation of age to chest history in sibs.

($X^2 = .012$ df = 1 $P > .90$ in disability group I) (Table XLVIII a.)

($X^2 = .898$ df = 1 $P > .70$ in disability group II)

($X^2 = .580$ df = 1 $P > .50$ in disability group III)

Nor can disability itself be shown to exert any significant influence on the numbers giving such a history in brothers and sisters.

(Younger men $X^2 = 4.714$ df = 2 $P > 0.05$) (Table XLVIII b.)

(Older men $X^2 = 1.696$ df = 2 $P > 0.30$)

For women, age at present and a chest history in a sib seem to be quite unrelated.

($X^2 = 0.260$ df = 1 $P > 0.50$ in disability group 1 + II)
(Table XLVIII a.)

($X^2 = 3.235$ df = 1 $P > 0.05$ in disability group III)

Disability itself bears no significance relation to a chest history in a sib.

(For women in all ages $X^2 = 0.218$ df = 2 $P > .80$)
(Table XLVIII b.)

4. PERSONAL HISTORY IN INFANCY

For men, a personal chest history very early in life seems to bear a significant relationship to present age, in disability groups II and III. Fewer older men and more younger men than expected report such a history in moderate and severe degrees of disability. In disability group I the numbers are small and after using Yates' correction no significance can be inferred.

($X^2 = 0.215$ df = 1 $P > 0.50$ in disability group I) (Table XLIX a.)
($X^2 = 6.294$ df = 1 $P < 0.02$ in disability group II)
($X^2 = 9.586$ df = 1 $P < 0.01$ in disability group III)

With reference to disability itself, no significant association can be traced for a personal chest history in infancy.

(Younger men $X^2 = 4.793$ df = 2 $P > 0.05$) (Table XLIX b.)
(Older men $X^2 = 0.212$ df = 1 $P > 0.50$)

For women, the influence of age in relation to this type of history has no significance.

($X^2 = .033$ df = 1 $P > .80$ in disability group I + II)
(Table XLIX a.)
($X^2 = .875$ df = 1 $P > .30$ in disability group III)

No significant association can be established between disability and a previous chest history in infancy for women.

(For women in all ages $X^2 = 1.848$ df = 2 $P > .30$)
(Table XLIX b.)

5. PERSONAL CHEST HISTORY IN CHILDHOOD

For men, some degree of statistical significance can be shown when childhood chest history is related to age. Fewer older men and more younger men than expected could report a childhood history in all disability groups but in group I a significant level is not attained.

($X^2 = 1.144$ df = 1 $P > 0.20$ in disability group I) (Table L a.)
($X^2 = 4.530$ df = 1 $P < 0.05$ in disability group II)
($X^2 = 20.768$ df = 1 $P < 0.01$ in disability group III)

For disability there is a significant association with chest history in childhood, among the younger ages, more such histories than expected occurring in severe disability and fewer in lesser and intermediate disability. In the older men no significant relation is forthcoming.

(Younger men $X^2 = 6.651$ df = 2 $P < 0.01$) (Table L b.)
(Older men $X^2 = 2.266$ df = 2 $P > 0.30$)

For women, no significance can be shown relating age to previous history in childhood.

($X^2 = 0.641$ df = 1 $P > 0.30$ in disability group I + II)
(Table L a.)
($X^2 = 2.947$ df = 1 $P > 0.05$ in disability group III)

When disability itself is considered in all ages there is no demonstrable relationship with previous history in childhood.

(For women in all ages $X^2 = 3.572$ df = 2 $P > .10$)
(Table L b.)

DISCUSSION

CHEST HISTORY

There is a significant association for both men and women in this series, between duration of personal history and disability, although the present age of patients has no relation to disability. It appears that bronchitis may start at any time in adult life, the chances of great disability in each case growing with the passage of time. This is interesting in the light of the findings of other observers.

The cases reported by Howell (1951) when arranged according to duration show a decrease in numbers from the most recent down to ten years, although 36% show a duration greater than ten years. Oswald studying the age at onset rather than the duration, finds 11% commencing in the first decade of life, 7% in the second decade and similar rates of onset for successive decades thereafter, in the region of 18% to 20%. The disease is thus cumulative in a community with advancing years, a statement which is confirmed by Oswald and Medvei (1955) and Pemberton (1956).

Stuart-Harris and Hanley (1957) find age is related to symptoms. The number of men in group G increases with increasing age in both the industrial and the rural populations; and there is a similar increase with age in group E symptoms for the industrial population. In the case of their women the numbers are small and no age relationship can be traced.

In the present survey a bronchial history in a previous generation or in a sib is unrelated to the occurrence of disability. This is out of keeping with the findings of previous workers, the difference being related probably to their concern with the presence of bronchitis rather than the degrees of disability.

FAMILY HISTORY

Bronchitis in a close relative occurs in 45% of Howell's cases (father 25%, mother 12%, brother or sister 8%), mother and father both being bronchitic in only one instance.

Among 1000 patients Oswald finds 803 bronchitic relatives out of 7,786 but this includes not only fathers, mothers, brothers and sisters but also half-brothers and half-sisters and sons and daughters. A series of 300 bronchitics and 300 controls produce respectively 256 relations with bronchitis and only 78 relations with bronchitis which seems a significant difference.

In the Stuart-Harris series there are two groups which are not identical, the bronchitic family history applying in the one case to parents and siblings and in the other to wife and children. In both cases a statistical difference is found for symptom groups E + G in the industrial population between the observed rates and that expected on the assumption that there is no relation between family history and present symptoms.

There is a statistical association between bronchitis and a family history in the Ogilvie study also. Here in the case of men, a family history in parents, brothers and sisters occurs in 8% of controls compared with 16% of cases and for women in 12% of controls compared with 24% of cases, the difference between the sexes being explained by the assumption that women folk have a better recollection of family illnesses, than do men.

A personal history in infancy bears no relation to subsequent disability in either sex of the present survey. A history of bronchitis in the childhood years is significantly associated with disability for younger men only and there is no parallel for women. Perhaps older men may reasonably be forgiven if their memories are suspect. Evidence of this kind is unlikely to be reliable in a large number and any suggestion of such a relationship in other surveys is very sketchy.

For example, a previous history in childhood seems important in 23% of Howell's cases (1951), all but 3% of these being recorded as previous bronchitis.

CLINICAL ATTRIBUTES

1. STATE OF NUTRITION

For women, nutrition is graded into fat, medium and spare types. There are too few grossly fat men to justify a group in themselves, and therefore men are considered as well-nourished or undernourished.

2. HAEMOGLOBIN

The clinical estimate by Sahli haemoglobinometer may be considered as a supplement to nutritional assessments as above.

3. PURULENCE OF SPUTUM

The occurrence of pus in the spit is important as a measure of the prevalence of infection and its relation to disability may be illuminating.

Since it is usually seasonal and often very intermittent although some cases show purulence more or less constantly, it has been thought fair to include not only those individuals where purulent sputum could be inspected in the morning specimen, but also a number reporting consistently yellow spit for periods.

4. SPUTUM VOLUMES

This assessment is based on the volume of specimens returned in the first hour's collection after waking. An analysis has been made contrasting the individuals returning specimens of over 2 ml. with those of 2 ml. and under, after excluding purulent specimens; and also when contrasting specimens under 2 ml., 2-6 ml., and over 6 ml. including all purulent cases.

5. SHOEMAKER'S CHEST DEFORMITY

All sternal depressions are included under this heading. The figures for this and the following chest deformities are obtained from the clinical notes and based on simple observation by inspection.

6. HARRISON'S SULCUS

It has been commonly taught that depression of the lower ribs is attributable to respiratory difficulty in early childhood. It will therefore be interesting to see whether there is a close relationship with disability grading.

7. KYPHOSIS

This signifies a clinical estimate of kyphosis without any actual measurements of the degree of angulation.

8. INTERCOSTAL RETRACTION

The retraction of intercostal spaces on inspiration has been thought worthy of comment and an analysis with relation to age and disability carried out. In thinner persons it may be an important sign in association with bronchospasm.

CLINICAL ATTRIBUTES

1. STATE OF NUTRITION

For men, no significant relationship between age and nutritional state can be established.

(X^2 = 1.914 df = 1 P $>$ .10 in disability group I) (Table LI a.)
(X^2 = 0.039 df = 1 P $>$ .80 in disability group II)
(X^2 = 0.014 df = 1 P $>$ .90 in disability group III)

A highly significant association exists between nutrition and disability for men in this series. There is a strong bias towards poor nourishment in gross disability and conversely towards good nutrition in slight and medium disability. Also associations between slight disability and medium nourishment, and between obesity and intermediate disability seem noteworthy.

(For men in all ages X^2 = 16.809 df = 4 P $<$ 0.01) (Table LI b.)

For women, the influence of age seems significant in the lesser degrees of disability, where more older women are obese and fewer medium or undernourished, but more younger women than expected are excessively thin and fewer than expected very well nourished. A similar trend in disability group III does not reach statistical significance.

(X^2 = 37.167 df = 2 P $<$ 0.01 in disability group I + II)
(Table LI a.)
(X^2 = 5.582 df = 2 P $>$ 0.05 in disability group III)

A significant association between disability and nutritional state exists for younger women. Severe disability is strongly associated

1. STATE OF NUTRITION (Continued)

with fatness and medium nutrition; the lesser degrees of disability with a spare build; but fewer cases than expected of poor nutrition in severe disability and fatness or medium nutrition are seen in lesser disability.

For older women, no significance attaches to disability in relation to nutritional state.

(Younger women $X^2 = 9.778$ df = 2 $P < 0.01$) (Table LI b.)

(Older women $X^2 = 1.606$ df = 2 $P > 0.30$)

2. HAEMOGLOBIN

The findings in regard to haemoglobin estimations are entirely negative. For men, no significance can be attached to age variations.

(X^2 = 4.241 df = 2 $P > 0.10$ in disability group I) (Table LII a.)

(X^2 = 4.864 df = 2 $P > 0.05$ in disability group II)

(X^2 = 5.293 df = 2 $P > 0.05$ in disability group III)

The relationship of disability to estimated haemoglobin level attracts no significance.

(For men in all ages X^2 = 6.485 df = 4 $P > 0.10$) (Table LII b.)

For women, no association exists between age and haemoglobin levels.

(X^2 = 2.312 df = 2 $P > 0.30$ in disability group I + II) (Table LII a.)

(X^2 = 1.527 df = 1 $P > .20$ in disability group III)

Disability in itself does not exert a significant influence on the haemoglobin level.

(For women in all ages X^2 = 0.569 df = 4 $P > 0.95$) (Table LII b.)

3. SPUTUM PURULENCE

For men, no significant relationship can be established between age and the presence verified or reported, of purulence in the sputum.

(X^2 = .413 df = 1 $P >$ .50 in disability group I) (Table LIII a.)
(X^2 = .418 df = 1 $P >$ .50 in disability group II)
(X^2 = .069 df = 1 $P >$ .70 in disability group III)

A significant association is obvious between disability itself and purulent sputum, more instances of pussy spit than expected occurring in gross disability and fewer than expected in lesser and intermediate disability.

(For men in all ages X^2 = 17.120 df = 2 $P <$ 0.01)
(Table LIII b.)

For women, age does have a significant role to play, fewer older women and more younger women with gross disability having purulent sputum. No similar effect is shown in lesser disability.

(X^2 = 0.000 df = 1 $P >$ .99 in disability group I + II)
(Table LIII a.)
(X^2 = 7.232 df = 1 $P <$ 0.01 in disability group III)

For women disability itself lacks significance in relation to the presence of pus in the sputum.

(Younger women X^2 = 5.009 df = 2 $P >$ 0.05) (Table LIII b.)
(Older women X^2 = 0.749 df = 1 $P >$ 0.30)

4. SPUTUM VOLUMES

When the purulent cases are excepted, for men no significant relation between age and sputum volume is forthcoming.

(X^2 = .021 df = 1 P $>$.80 in disability group I) (Table LIV a.)

(X^2 = .139 df = 1 P $>$.70 in disability group II)

(X^2 = nil after Yates' correction in group III)

Disability, on the other hand does exert a significant influence on sputum volume, more cases than expected occurring with high volumes in disability groups II and III and fewer than expected in disability group I.

(For men in all ages X^2 = 14.488 df = 2 P $<$0.01)
(Table LIV b.)

For women, age exerts no significant influence on sputum volume in non-purulent cases.

(X^2 = .826 df = 1 P $>$.30 in disability groups I + II)
(Table LIV a.)
(X^2 = .268 df = 1 P $>$.50 in disability group III)

Disability in itself has no association with volume of mucoid sputum for women.

(For women in all ages X^2 = 2.751 df = 2 P $>$.20)
(Table LIV b.)

4a. SPUTUM VOLUMES PURULENT CASES INCLUDED

For men there are too few individuals returning specimens of over six ml. volume to allow complete analysis in regard to the influence of age. When sputum volume is assessed for all cases irrespective of purulence, it is found that no association exists between age and the amount of sputum for men.

(X^2 = .454 df = 1 P $>$ .50 in disability group I) (Table LIV c.)
(X^2 = 2.674 df = 1 P $>$ .10 in disability group II)
(X^2 = .352 df = 1 P $>$ .50 in disability group III)

Disability itself can again be shown to be significantly related to sputum volume, more grossly disabled men than expected having copious sputum and fewer of the least disabled doing so, and conversely more of the least disabled and fewer of the grossly disabled having scanty sputum.

(X^2 = 10.01 df = 4 P $<$ 0.05 for all ages) (Table LIV d.)

For women, in the group with greatest disability no significant relationship exists between age and sputum volume, but in the lesser degrees of disability it seems that an association of age and quantity of sputum must be acknowledged. More older women than expected return small specimens, and fewer return moderately large specimens than expected and conversely fewer younger women return small specimens and more return large specimens than expected.

(X^2 = 10.36 df = 2 P $<$ 0.01 in combined groups I and II)
(Table LIV c.)

Disability cannot be shown to be significantly related to the sputum volume in either the younger or the older aged women.

(X^2 = 5.979 df = 2 P $>$ 0.05 in younger age group) (Table LIV d.)
(X^2 = 1.294 df = 1 P $>$ .20 in older age group)

5. SHOEMAKER'S CHEST DEFORMITY

For men, there is no significant relationship between age and the occurrence of sternal depressions.

(X^2 = 2.80 df = 1 $P > 0.05$ in disability group I) (Table LV a.)
(X^2 = 0.25 df = 1 $P > 0.50$ in disability group II)
(X^2 = 0.42 df = 1 $P > 0.50$ in disability group III)

Farther in the case of disability, analysis fails to demonstrate any significant association for this type of chest deformity.

(For men in all ages X^2 = 0.612 df = 2 $P > .30$)
(Table LV b.)

For women, similarly no significance can be attributed to the influence of age.

(X^2 = 1.327 df = 1 $P > .20$ in all disability groups) (Table LV a.)

The influence of disability cannot be shown to be significant for women.

(For women in all ages X^2 = 1.935 df = 2 $P > .30$)
(Table LV b.)

6. HARRISON'S SULCUS

For men, there is no significance when age is considered with reference to the occurrence of Harrison's sulcus.

(X^2 = 3.034 df = 1 P $>$0.05 in disability group I) (Table LVI a.)

(X^2 = 0.700 df = 1 P $>$0.30 in disability group II)

(X^2 = 0.830 df = 1 P $>$0.30 in disability group III)

Disability itself bears no significant relation to the incidence of Harrison' sulcus for men.

(For men in all ages X^2 = 4.977 df = 2 P $>$0.05)
(Table LVI b.)

For women, on the other hand, age seems to exert a material influence on the numbers showing sulcus deformity. Fewer older women and more younger women than expected do so but the numbers are small unless all degrees of disability are taken together.

(X^2 = 4.421 df = 1 P $<$0.05 in all disability groups)
(Table LVI a.)

When the influence of disability is considered significance is reflected in the younger age group only. There is a strong association between sulcus formation and lesser disability groups I and II, and conversely less with greater disability group III. In older age group no such relationship is apparent.

(Younger women X^2 = 6.710 df = 1 P$<$0.01)
(Table LVI b.)
(Older women X^2 = 0.028 df = 1 P $>$0.80)

7. KYPHOSIS

For men, no significant relation can be traced between present age and the presence of kyphosis.

(X^2 = .582 df = 1 P $>$ .30 in disability group I)

(X^2 = .013 df = 1 P $>$ .90 in disability group II)
(Table LVII a.)

(X^2 = .761 df = 1 P $>$ .30 in disability group III)

The association of disability with obvious kyphosis on the other hand, does exhibit significance in a statistical sense. More men with gross disability and fewer men with lesser disability than expected show frank kyphosis.

(For men in all ages X^2 = 12.515 df = 2 P $<$ 0.01)
(Table LVII b.)

For women, the influence of age is significant in disability groups I and II but not in disability group III. Fewer younger women and more older women than expected show frank kyphosis in the lesser degrees of disability.

(X^2 = 8.410 df = 1 P $<$ 0.01 in disability group I + II)
(Table LVII a.)

(X^2 = 2.596 df = 1 P $>$ 0.10 in disability group III)

Disability itself shows no significant relation to obvious kyphosis for women.

(Younger women X^2 = 0.005 df = 1 P $>$ .90) (Table LVII b.)

(Older women X^2 = 1.063 df = 1 P $>$ .30)

8. INTERCOSTAL RETRACTION

For men, no significant relationship exists between present age and the occurrence of this sign.

($X^2 = 1.495$ df = 1 $P > .30$ in disability group I)
(Table LVIII a.)

($X^2 = 1.115$ df = 1 $P > .20$ in disability group II)

($X^2 = 0.513$ df = 1 $P > .30$ in disability group III)

Disability on the other hand, is significantly associated with retraction of intercostal spaces, more men in severe disability and fewer than expected in slight and intermediate grades of disability showing the sign.

(For men in all ages $X^2 = 31.482$ df = 2 $P < 0.01$)
(Table LVIII b.)

For women, the numbers showing intercostal retraction are small. Nevertheless no significance can be traced in the relation of present age to this sign.

($X^2 = .786$ df = 1 $P > .30$ in disability groups I + II)
(Table LVIII a.)

($X^2 = .002$ df = 1 $P > .95$ in disability group III)

Disability itself is not significantly related to the occurrence of intercostal retraction.

(For women in all ages $X^2 = .636$ df = 2 $P > .30$)
(Table LVIII b.)

DISCUSSION

CLINICAL ATTRIBUTES

In this series for men poor nourishment is associated with disability in all ages, but for women there is only significance for younger ages, severe disability being related to obesity or medium nourishment. The difference between the sexes lies in all probability in the greater numbers of emphysema cases in men. Overweight subjects of either sex with moderate to severe disability are expected to fare worse than their leaner counterparts. After weight reduction the clinical effects of disability are observed to diminish, thus underweight severely disabled men will survive the rigours of successive winters longer than their stouter neighbours.

The observations on haemoglobin show no relation to disability for either sex.

Analysis of the sputum specimens made available shows a significant relation between purulence and disability for the men of this series, but not for the women. This is not unexpected in view of the well recognised later stages of bronchitis with recurring infection which tends to become constant.

With regard to sputum volumes in this series whether the purulent cases be included or excluded, high volumes are associated with disability for men but no such relation is demonstrated for women. The negative findings for women raise a query whether they have been able to void sputum efficiently. It is a general impression that more women than men find difficulty in producing specimens and probably swallow secretions normally. The results for men are in accord with the findings of Fletcher and Tinker (1961) who find correlation of sputum volumes with Peak Flowrates.

In this series for men there is no association between disability and either shoemaker chest deformity or Harrison's sulcus, but both kyphosis and visible intercostal retraction are significantly related to disability, whereas for women no significant influences can be traced for these physical signs except in the case of younger women only for an inverse relation between sulcus deformity and disability.

The shape of the thoracic cage has been said to be unimportant (Simon and Galbraith 1953), and the present findings bear this opinion out. Nevertheless retraction and spinal curvature are important, the one as a consequence the other perhaps as a contributory cause of respiratory difficulty.

PHYSICAL SIGNS SUGGESTING EMPHYSEMA

It is probably safe to assert that in no case is any one of these signs sufficient alone to indicate likely emphysema, yet taken together several may by their presence, be highly suggestive. Nor is it safe to equate disability with frank emphysema, in chronic bronchitis. Nevertheless, it seems necessary to estimate the association of each sign in turn to such disability as is presented in this series of men and women. The list of pointers is probably not exhaustive but sufficiently embracing to serve as a test assessment of clinical methods. (From Price's Medicine "Emphysema")

1. BARRELLING

Increased anteroposterior diameter till approaches the transeverse diameter. In this context it is estimated on clinical impression.

2. SHORT NECK

Elevation of the ribs is said to cause this appearance in the effort to increase chest capacity.

3. PROMINENT STERNOMASTOIDS

In naturally long or excessively thin necks this sign may be imitated but no confusion is likely when the general appearance is considered.

4. SUPRACLAVICULAR BULGING

Ballooning above the usual apical level especially in talking and coughing has been recorded whatever the phase of respiration.

5. INSPIRATORY POSTURE

In this condition the true expiratory phase is not seen, the internal volume of thorax being maintained at an increased level.

6. FULL JUGULAR VEINS

The presence of this sign has been recorded whether considered to be due to cardiac embarrassment or perhaps directly to alteration of the mechanics of respiration.

7. EMPHYSEMATOUS GIRDLE

Emphysematous girdle has been reported when any degree of similar appearance is seen, from a complete belt of fine venules around the lower chest, down to small patches across the lower anterior rib margins.

(Numbers 1 to 7 are clinical estimates based on visual inspection)

8. HYPERRESONANCE

Any case with generally more hollow percussion note than normal has been recorded a positive, which must therefore be essentially a personal estimate from memory.

9. RESONANCE EXTENDING BEYOND NORMAL TO THE COSTAL MARGIN

This may be considered more reliable by virtue of being a direct observation.

10. WEAK RESPIRATORY MURMUR

This feature may be difficult to assess, for example in the case of thick chest wall. However any which seemed to lack the customary clarity of rustling leaves have been noted as weakened sounds.

11. DIMINISHED VOCAL FREMITUS

12. DIMINISHED VOCAL RESONANCE

These signs are again comparative observations from memory yet seldom is real difficulty encountered in deciding when to record a positive.

13. PROLONGED EXPIRATION

In obstructive lung disease this may be a most important sign; being direct in observation it ought to be reliable.

14. ABSENCE OF CARDIAC IMPULSE

In a remarkable number of cases no true apex beat can be detected. Many others show marked diminution of pulsation. The only detected impulse in some instances is located in the epigastrium below the ribs. Sheer thickness of chest wall must be excluded carefully.

15. DIMINISHED CARDIAC DULLNESS

The overlap of emphysematous lung giving increased resonance does often blot out the superficial area of cardiac dullness completely.

16. WEAK CARDIAC SOUNDS

For the same reason, very real weakening of cardiac sounds on auscultation may result in muffling and distant sounds, distinct from any alteration in quality.

17. DIMINISHED LIVER DULLNESS

This observation will reinforce those made at numbers 9. and 15. As far as possible the attention is directed to the observation in hand without reference to how the general trend is going. No attempt is made to make a coherent assessment as in normal clinical examination, in order as far as possible to keep an unbiassed approach.

PHYSICAL SIGNS SUGGESTING EMPHYSEMA

1. BARRELLING

For men, no significance can be attributed to age variations in disability groups II and III, but a significant association exists in disability group I. Fewer younger men and more older men than expected show the typical barrelling among those with slightest disability.

(X^2 = 3.903 df = 1 $P < 0.05$ in disability group I) (Table LIX a.)
(X^2 = 0.459 df = 1 $P > 0.30$ in disability group II)
(X^2 = 0.310 df = 1 $P > 0.50$ in disability group III)

Disability cannot be linked with barrelling in a statistical sense in either of the age groups.

(Younger men X^2 = 4.314 df = 2 $P > .10$) (Table LIX b.)
(Older men X^2 = 4.275 df = 2 $P > .10$)

For women, age seems a significant factor in the lesser disability groups where fewer younger women and more older women than expected show appreciable barrel tendency. In severe disability no significance attaches to the influence of age.

(X^2 = 10.583 df = 1 $P < 0.01$ in disability groups I + II) (Table LIX a.)
(X^2 = 0.267 df = 1 $P > 0.50$ in disability group III)

A significant association exists between disability and barrelling for younger women, more instances of barrel chest in severe disability and fewer instances than expected in lesser disability being apparent. For older women no such significance is evident.

(Younger women X^2 = 12.729 df = 1 $P < 0.01$) (Table LIX b.)
(Older women X^2 = 0.485 df = 1 $P > 0.30$)

2. SHORT NECK

For men, present age has no relation to the presence or otherwise of this attribute.

($X^2 = 3.824$ df = 1 $P > 0.05$ in disability group I) (Table LX a.)

($X^2 = 1.317$ df = 1 $P > 0.20$ in disability group II)

($X^2 = 0.310$ df = 1 $P > 0.50$ in disability group III)

There is an appreciable association between disability and shortness of neck, determined on inspection. Significantly more men than expected in severe disability and fewer men than expected in lesser disability show short necks.

(For men in all ages $X^2 = 17.560$ df = 2 $P < 0.01$) (Table LX b.)

For women, the influence of age seems significant in lesser disability. Fewer younger women and more older women than expected can be considered short necked in disability groups I and II. No similar significance is reflected in group III.

($X^2 = 4.371$ df = 1 $P < 0.05$ in disability group I + II) (Table LX a.)

($X^2 = 0.093$ df = 1 $P > 0.70$ in disability group III)

Disability itself shows a significant association for the short neck among younger women, more short necks being related to gross disability than expected and fewer than expected to lesser degrees of disability. For older women no significance attaches to disability.

(Younger women $X^2 = 7.411$ df = 1 $P < 0.01$) (Table LX b.)

(Older women $X^2 = 0.575$ df = 1 $P > 0.30$)

3. PROMINENT STERNOMASTOID

For men, no significant association between present age and prominence of the sternomastoids can be demonstrated except in disability group I, where more older men and fewer younger men than expected exhibit this sign.

($X^2 = 10.425$ df = 1 $P < 0.01$ in disability group I)
(Table LXI a.)

($X^2 = 0.677$ df = 1 $P > 0.30$ in disability group II)

($X^2 = 1.123$ df = 1 $P > 0.20$ in disability group III)

Significance can be traced in the relationship of disability to prominence of sternomastoids, in each group for men.

The association in each case is between prominence of the muscle belly and gross disability and fewer instances than expected are recorded in lesser disability.

(Younger men $X^2 = 19.057$ df = 2 $P < 0.01$) (Table LXI b.)

(Older men $X^2 = 28.338$ df = 2 $P < 0.01$)

For women, no significant influence can be attributed to present age.

($X^2 = 0.305$ df = 1 $P > 0.50$ in disability groups I + II)
(Table LXI a.)

($X^2 = 3.112$ df = 1 $P > 0.05$ in disability group III)

Considering all ages for women, disability shows a significant association with prominence of sternomastoids. As for men, the sign is linked with severe disability.

(For women in all ages $X^2 = 6.407$ df = 2 $P < 0.05$)
(Table LXI b.)

4. SUPRACLAVICULAR BULGING

For men, no significance attaches to the influence of age in relation to the incidence of supraclavicular bulging.

($X^2 = 2.519$ df = 1 $P > 0.10$ in disability group I) (Table LXII a.)

($X^2 = 3.530$ df = 1 $P > 0.05$ in disability group II)

($X^2 = 3.215$ df = 1 $P > 0.05$ in disability group III)

Disability itself shows no significant association with apical bulging.

(For men in all ages $X^2 = 1.183$ df = 2 $P > .50$) (Table LXII b.)

For women, the influence of age is appreciable, in lesser degrees of disability significantly more older women than expected and fewer younger women showing supraclavicular bulging. In gross disability no such significance is demonstrated with regard to age.

($X^2 = 18.402$ df = 1 $P < 0.01$ in disability groups I + II) (Table LXII a.)

($X^2 = 0.003$ df = 1 $P > 0.95$ in disability group III)

With regard to disability itself, significance is reflected among younger women only, more cases with bulging occurring in severe disability than expected and fewer than expected in lesser disability. For older women no significant bias can be traced.

(Younger women $X^2 = 5.924$ df = 1 $P < 0.02$) (Table LXII b.)

(Older women $X^2 = 2.799$ df = 1 $P > 0.05$)

5. INSPIRATORY POSTURE

For men, present age relates significantly to maintenance of the inspiratory posture in disability group II but not in disability groups I and III. Significantly fewer younger men and more older men than expected show it in intermediate disability.

(X^2 = 2.882 df = 1 $P > 0.05$ in disability group I)
(Table LXIII a.)
(X^2 = 11.367 df = 1 $P < 0.01$ in disability group II)
(X^2 = 0.036 df = 1 $P > 0.80$ in disability group III)

There is a significant association between disability and inspiratory posture in both age groups for men, slight disability being linked with a low incidence of inspiratory posture and severe disability with a high incidence, intermediate disability tending to have reduced incidence also.

(Younger men X^2 = 18.028 df = 2 $P < 0.01$) (Table LXIII b.)
(Older men X^2 = 10.015 df = 2 $P < 0.01$)

For women also, age is related to the maintenance of inspiratory posture in combined disability groups I and II, where significantly fewer women than expected in younger age group and more older women show this sign. Although the trend is similar no significance is shown in severe disability.

(X^2 = 13.813 df = 2 $P < 0.01$ in disability groups I + II)
(Table LXIII a.)
(X^2 = 3.822 df = 1 $P > 0.05$ in disability group III)

An association between disability and this sign is significant only in younger women, although the trend is similar in each age group,

5. INSPIRATORY POSTURE (Continued)

more women showing it than expected in severe disability and the converse in lesser disability.

(Younger women $X^2 = 9.687$ df = 1 $P < 0.01$) (Table LXIII b.)

(Older women $X^2 = 1.472$ df = 1 $P > 0.20$)

6. FULL JUGULAR VEINS

For men, the incidence of full jugular veins is significantly related to present age except in severe disability, older men being prone to show full jugulars and conversely younger men being less likely to do so.

(X^2 = 5.354 df = 1 $P < 0.05$ in disability group I) (Table LXIV a.)
(X^2 = 10.660 df = 1 $P < 0.01$ in disability group II)
(X^2 = 2.495 df = 1 $P > 0.10$ in disability group III)

Yet disability itself is not significantly associated with the presence of full jugulars in either age group.

(Younger men X^2 = 3.210 df = 2 $P > .20$) (Table LXIV b.)
(Older men X^2 = 0.744 df = 2 $P > .50$)

For women, no significance can be attributed to the influence of age.

(X^2 = 0.948 df = 1 $P > .30$ in disability groups I + II) (Table LXIV a.)
(X^2 = 1.168 df = 1 $P > .20$ in disability group III)

Nor is significance forthcoming in relation to disability when considering full jugular veins.

(For women in all ages X^2 = 1.176 df = 2 $P > .50$) (Table LXIV b.)

7. EMPHYSEMATOUS GIRDLE

When the incidence of emphysematous girdle is studied with reference to age, some evidence of statistical significance is found.

For men, significantly fewer younger men and more older men than expected exhibit the sign in slight disability. No significant relationship with age can be seen in intermediate and severe disability.

($X^2 = 7.687$ df = 1 $P < 0.01$ in disability group I) (Table LXV a.)
($X^2 = 0.325$ df = 1 $P > 0.50$ in disability group II)
($X^2 = 3.053$ df = 1 $P > 0.05$ in disability group III)

When disability is considered in relation to emphysematous girdle, no significant association can be seen.

(Younger men $X^2 = 3.049$ df = 2 $P > .20$) (Table LXV b.)
(Older men $X^2 = 3.331$ df = 2 $P > .10$)

For women, the relationship of age with the occurrence of this sign is not significant in lesser disability, but in severe disability significantly more older women and fewer younger women than expected show the emphysematous girdle.

($X^2 = 1.616$ df = 1 $P > 0.20$ in disability groups I + II) (Table LXV a.)
($X^2 = 8.162$ df = 1 $P < 0.01$ in disability group III)

Any relation between disability grade and emphysematous girdle is not significant for women.

(Younger women $X^2 = 0.798$ df = 1 $P > .30$) (Table LXV b.)
(Older women $X^2 = 1.213$ df = 1 $P > .20$)

8. HYPERRESONANCE

For men, the relation of increased resonance generally to present age has no statistical significance in any of the disability groups.

($X^2 = 0.362$ df = 1 $P > .50$ in disability group I) (Table LXVI a.)
($X^2 = 1.188$ df = 1 $P > .20$ in disability group II)
($X^2 = 0.000$ df = 1 $P > .99$ in disability group III)

Nor does the incidence of hyperresonance bear a significant relation to degree of disability.

(For men in all ages $X^2 = 4.594$ df = 2 $P > .10$) (Table LXVI b.)

For women, similarly there is no significant relationship between age and the occurrence of hyperresonance.

($X^2 = 1.616$ df = 1 $P > .20$ in disability groups I + II)
($X^2 = 0.112$ df = 1 $P > .70$ in disability group III)
(Table LXVI a.)

Again, the association of hyperresonance for disability has no significance.

(For women in all ages $X^2 = 1.750$ df = 2 $P > .30$) (Table LXVI b.)

9. RESONANCE EXTENDING BEYOND NORMAL TO COSTAL MARGIN

For men, present age bears no significant relation to the occurrence of abnormally extensive resonance.

($X^2 = 1.555$ df = 1 $P > .20$ in disability group I) (Table LXVII a.)
($X^2 = 1.922$ df = 1 $P > .10$ in disability group II)
($X^2 = 0.884$ df = 1 $P > .30$ in disability group III)

When this sign is considered with regard to degree of disability, significance is evident in the association, more grossly disabled men than expected and fewer slightly or moderately disabled men exhibiting abnormally extensive resonance.

(For men in all ages $X^2 = 7.285$ df = 2 $P < 0.05$
(Table LXVII b.)

For women, no significant relation exists between age and resonance extending to the costal margin.

($X^2 = 2.734$ df = 1 $P > 0.05$ in disability groups I + II)
(Table LXVII a.)
($X^2 = 0.001$ df = 1 $P > 0.95$ in disability group III)

When the degree of disability is considered with reference to abnormally extensive resonance for women, no statistical significance is seen.

(For women in all ages $X^2 = 3.141$ df = 2 $P > .20$)
(Table LXVII b.)

10. WEAK RESPIRATORY MURMUR

For men, any relation of diminished respiratory murmur to present age, has no statistical significance.

(X^2 = 2.396 df = 1 P $>$ .10 in disability group I)
(Table LXVIII a.)
(X^2 = 1.303 df = 1 P $>$ .20 in disability group II)
(X^2 = 0.149 df = 1 P $>$ .50 in disability group III)

On the other hand a statistical relationship does exist between weakening of respiratory sounds and the degree of disability due to chronic bronchitis. Significantly more grossly disabled men and fewer slight or moderately disabled men than expected show the sign.

(For men in all ages X^2 = 8.354 df = 2 P $<$ 0.02)
(Table LXVIII b.)

For women, there is no significant relationship between age and the occurrence of diminished respiratory murmur.

(X^2 = 1.279 df = 1 P $>$ .20 in disability groups I + II)
(Table LXVIII a.)
(X^2 = 0.009 df = 1 P $>$ .90 in disability group III)

When the relation of weak respiratory sounds to disability itself is studied for women, no significance is forthcoming.

(For women in all ages X^2 = 2.171 df = 2 P $>$ .30)
(Table LXVIII b.)

11. DIMINISHED VOCAL FREMITUS

For men, present age bears no significant relation to the occurrence of diminished vocal fremitus.

(X^2 = .676 df = 1 P > .30 in disability group I)
(Table LXIX a.)
(X^2 = .587 df = 1 P > .10 in disability group II)
(X^2 = .253 df = 1 P > .50 in disability group III)

There is a significant association between this sign and degree of disability for men, more grossly disabled men and fewer slightly and moderately disabled men than expected showing diminution of vocal fremitus.

(For men in all ages X^2 = 11.122 df = 2 P < 0.01)
(Table LXIX b.)

For women, the influence of age has some significance but only in lesser degrees of disability where fewer older women than expected and more younger women than expected show generally diminished vocal fremitus. In severe disability age does not exert appreciable influence.

(X^2 = 5.290 df = 1 P < 0.02 in disability groups I + II)
(Table LXIX a.)
(X^2 = 2.592 df = 1 P > 0.10 in disability group III)

When disability alone is considered with regard to diminished vocal fremitus, no significance is evident.

(Younger women X^2 = 0.435 df = 2 P > .80)
(Table LXIX b.)
(Older women X^2 = 0.005 df = 1 P > .90)

12. VOCAL RESONANCE DIMINISHED

For men, the prevalence of diminished vocal resonance bears no significant relation to present age.

($X^2 = 0.662$ df = 1 $P > 0.30$ in disability group I)
(Table LXX a.)
($X^2 = 0.644$ df = 1 $P > 0.30$ in disability group II)
($X^2 = 0.471$ df = 1 $P > 0.30$ in disability group III)

When diminution of vocal resonance is assessed with reference to disability, statistical significance is shown. More grossly disabled men and fewer slightly or moderately disabled men than expected exhibit the sign.

(For men in all ages $X^2 = 10.224$ df = 2 $P < 0.01$)
(Table LXX b.)

For women, the association of this attribute with age is not significant.

($X^2 = 0.561$ df = 1 $P > 0.30$ in disability groups I + II)
(Table LXX a.)
($X^2 = 0.150$ df = 1 $P > 0.50$ in disability group III)

When diminution of vocal resonance is considered in relation to disability for women, no significance is forthcoming.

(For women in all ages $X^2 = 3.806$ df = 2 $P > 0.10$)
(Table LXX b.)

13. PROLONGED EXPIRATION

For men, there is no significant relationship between present age and the occurrence of prolonged expiratory phase of respiration noted on auscultation.

(X^2 = 0.556 df = 1 P $>$ 0.30 in disability group I)
(Table LXXI a.)
(X^2 = 0.946 df = 1 P $>$ 0.30 in disability group II)
(X^2 = 1.436 df = 1 P $>$ 0.20 in disability group III)

On the other hand, degree of disability shows a significant relationship with prolonged expiration. Significantly more grossly disabled men than expected and fewer slightly or moderately disabled men are observed to have undue prolongation of expiration than expected.

(For men in all ages X^2 = 13.847 df = 2 P $<$ 0.01)
(Table LXXI b.)

For women, the results closely parallel those for men. No significance is apparent when age and prolongation of expiration are considered.

(X^2 = 2.039 df = 1 P $>$ 0.10 in disability groups I + II)
(Table LXXI a.)
(X^2 = 0.250 df = 1 P $>$ 0.50 in disability group III)

The association between prolonged expiratory phase of respiration and disability itself is of statistical significance for women, fewer women than expected from lesser disability groups and more women from the severest disability group, exhibiting the sign.

(For women in all ages X^2 = 12.638 df = 2 P $<$ 0.01)
(Table LXXI b.)

14. ABSENCE OF CARDIAC IMPULSE

For men, there is no significant relationship between absence of detectable cardiac impulse and age.

(X^2 = 0.060 df = 1 P $>$ 0.80 in disability group I)
(Table LXXII a.)
(X^2 = 0.642 df = 1 P $>$ 0.30 in disability group II)
(X^2 = 0.079 df = 1 P $>$ 0.30 in disability group III)

There is a high degree of association between disability and diminution and absence of apex beat for men in this series. Significantly fewer men than expected with slight disability and more men with gross disability (and to some extent those with intermediate disability), have apex beats which are either absent or almost impossible to define.

(X^2 = 13.386 df = 2 P $<$ 0.01 for men in all ages)
(Table LXXII b.)

For women, age bears no relation to the incidence of absent cardiac impulse.

(X^2 = 2.836 df = 1 P $>$ 0.05 in disability groups I + II)
(Table LXXII a.)
(X^2 = 0.228 df = 1 P $>$ 0.050 in disability group III)

No significance can be attributed to any association between absence of apex beat and disability grade for women.

(X^2 = 5.321 df = 2 P $>$ 0.05 for women in all ages.)
(Table LXXII b.)

15. DIMINISHED CARDIAC DULLNESS

For men, the incidence of diminished area of superficial cardiac dullness bears no significant relationship to age.

(X^2 = 1.949 df = 1 $P > 0.10$ in disability group I)
(Table LXXIII a.)
(X^2 = 0.789 df = 1 $P > 0.30$ in disability group II)
(X^2 = nil after Yates' correction in disability group III)

A very strong association exists between diminution of cardiac dullness and disability grading for men. More men with severe disability than expected and fewer men than expected with lesser disability show this sign.

(For men in all ages X^2 = 26.109 df = 2 $P < 0.01$)
(Table LXXIII b.)

For women, any age variations in the numbers showing diminished cardiac dullness, are not significant.

(X^2 = 0.058 df = 1 $P > 0.80$ in disability groups I + II)
(Table LXXIII a.)
(X^2 = 1.365 df = 1 $P > 0.20$ in disability group III)

On the other hand the association of disability and diminution of superficial cardiac dullness, is statistically significant for women. Fewer women than expected with slight and intermediate disability and more women with gross disability show reduced dullness.

(For women in all ages X^2 = 17.571 df = 2 $P < 0.01$)
(Table LXXIII b.)

16. WEAK CARDIAC SOUNDS

For men, present age seems to have no bearing on the numbers exhibiting impaired strength of cardiac sounds on auscultation.

(X^2 = 1.566 df = 1 $P > 0.20$ in disability group I)
(Table LXXIV a.)
(X^2 = 2.389 df = 1 $P > 0.10$ in disability group II)
(X^2 = 1.217 df = 1 $P > 0.20$ in disability group III)

The relationship of weakened cardiac sounds with disability is strong. Significantly fewer men than expected with lesser or intermediate disability and more men with severe disability exhibit weak sounds.

(For men in all ages X^2 = 20.566 df = 2 $P < 0.01$)
(Table LXXIV b.)

For women, the influence of age seems to be significant in lesser disability, fewer younger women than expected and more older women presenting difficulty in hearing the cardiac sounds. In severe disability no such significance can be traced.

(X^2 = 11.669 df = 1 $P < 0.01$ in disability groups I + II)
(Table LXXIV a.)
(X^2 = 0.029 df = 1 $P > 0.80$ in disability group III)

When difficulty in auscultating the cardiac sounds is assessed in relation to disability for women, no statistical significance is indicated.

(Younger women X^2 = 1.573 df = 2 $P > 0.30$)
(Table LXXIV b.)
(Older women X^2 = 2.986 df = 1 $P > 0.05$)

17. DIMINISHED LIVER DULLNESS

For men, there is no significance in the relation of age to the occurrence of diminished liver dullness.

(X^2 = 0.258 df = 1 P $>$ 0.50 in disability group I)
(X^2 = 1.185 df = 1 P $>$ 0.10 in disability group II) (Table LXXV a.)
(X^2 = 0.033 df = 1 P $>$ 0.80 in disability group III)

When the association between diminished liver dullness and disability is considered, statistical significance is evident. More men than expected with severe disability and fewer men with slight and intermediate disability show this sign.

(For men in all ages X^2 = 28.378 df = 2 P $<$ 0.01)
(Table LXXV b.)

For women, present age exerts no significant influence with regard to diminution of liver dullness.

(X^2 = 0.246 df = 1 P $>$ 0.50 in disability groups I + II)
(Table LXXV a.)
(X^2 = 1.043 df = 1 P $>$ 0.30 in disability group III)

On the other hand a distinct link exists between disability from chronic bronchitis and diminished liver dullness for these women. Significantly fewer women with lesser disability and more women than expected with severe disability show such a diminution of dullness.

(X^2 = 7.196 df = 2 P $<$ 0.05 for women in all ages)
(Table LXXV b.)

RADIOLOGICAL ASSESSMENT

The survey of Oswald and Medvei is supported by a radiological study reported by Simon and Medvei (1962) the cases being grouped according to the absence, the presence of local, or of general emphysema.

The criteria employed are instructive:

1. EVIDENCE of EXCESS AIR

Low flat diaphragm: Subjective in relation to width of chest or below anter. end 7th. right rib. No even and obvious superior convex curvature. Horizontal diaphragm on lateral view. Very large retrosternal translucent area, subjectively judged.

Curvature of sternum or kyphosis.

AIR TRAPPING. On deep expiration film: Range of diaphragm movement less than 3 cm. Relative translucency when other presumed normal areas have darkened.

2. CHANGES IN CARDIOVASCULAR PATTERN

Narrow vertical heart. Transv. diameter heart under 11 cm. or cardiothoracic ratio under 40%. Straight or convex lateral border of heart. Large hilar vessels, small narrow intrapulmonary vessels.

3. LOCAL OVERDISTENSION

Bullae, as hypertranslucent avascular areas.

If any doubt, regarded as normal; but if two out of the three groups of signs positive, regarded as emphysema.

ASSESSMENT OF CLINICAL SIGNS OF EMPHYSEMA

Fletcher (1952) has demonstrated the fallibility of clinical observations with reference to signs of emphysema in a series of 20 patients with pneumoconiosis or emphysema as reported by eight different observers. Agreement as to the presence or absence of individual signs is found in 70 to 80% of instances, and disagreement in 20 to 30%.

Linear measurement variation of as much as 1" in expansions, and a 26% chance of disagreement between any observer and the others in the presence or absence of a sign such as palpable apex beat, are found. It seems possible this is no more inaccurate than many clinical observations which have been credited with scientific precision!

The eleven signs are :

Barrelling, wide subcostal angle, kyphosis, use of accessory muscles, impaired chest expansion, movement en bloc, generalised hyperresonance, impaired liver dullness, impaired cardiac dullness, absent apical impulse, and impaired breath sounds.

DISCUSSION

PHYSICAL SIGNS INDICATING EMPHYSEMA

Of the seventeen signs reputed to indicate emphysema, only twelve have been shown to bear a significant relation to disability for men, the exceptions being strangely, barrelling and supraclavicular bulging and full jugulars, emphysematous girdle, and hyperresonance.

For all women, only four signs are significant with relation to disability, namely prominent sternomastoid, prolonged expiration, diminished cardiac dullness, and diminished liver dullness. For younger women only, a further four hold significance; these are in addition to barrelling and supraclavicular bulging, short neck and inspiratory posture. The sex difference is quite remarkable. Since a single observer has been involved it seems unlikely to depend on variation inthe standards of awareness. Only a proportion of the most disabled subjects and a relatively small number in disability groups I and II have been confirmed as emphysematous, and overt emphysema does not account for all the instances of really gross disability. Nevertheless, for men at least these signs as a group relate remarkably well to respiratory disability as represented in this series.

OTHER PHYSICAL SIGNS

1. BRONCHOSPASM

All rhonchii of any grade whether accompanied by other adventitious sounds or not have been recorded under this heading.

2. MITRAL SYSTOLIC MURMURS

All apical murmurs, systolic in time and not greater than grade III have been recorded for this purpose.

3. CYANOSIS

All instances of blue colour whether peripheral or central in distribution have been included, irrespective of cause.

4. OEDEMA

All cases showing oedema have been included, no attempt being made to exclude causes other than cardiac failure or nephritis.

5. CLUBBING, BEAKING OF NAILS AND SPOONING

Any of these occurring in the course of examination have been included since on occasions there seems to be great similarity.

6. RADIAL ARTERY THICKNESS

Estimation of radial artery condition with regard to thickness and tortuosity has been made. It has been found necessary to fuse the groups, the differentiation eventually being between arteries without thickening and arteries with thickening.

OTHER PHYSICAL SIGNS (Continued)

7. DEFICIENT DORSALIS PEDIS PULSATION

8. DEFICIENT POSTERIOR TIBIAL PULSATION

Observations on arterial pulsation have been included and the divergences recorded are quite marked. It may be of interest therefore to find whether there is any relation to chest disability.

9. VARICOSITIES

10. OPTIC FUNDUS

Any suspicious fundal changes have been included but the numbers are small for conclusions to be made.

11. HERNIA

In view of the long term effect of persistent cough an important association with disability may be expected given sufficient numbers.

12. THYROID

Under this heading is included any abnormality noted on examination such as present goitre or previous operation. Sufficient numbers for a study are available only for women.

OTHER PHYSICAL SIGNS

1. BRONCHOSPASM

For men, no significant relationship between age and bronchospasm can be demonstrated.

(X^2 = 1.480 df = 1 P $>$0.20 in disability group I)
(Table LXXVI a.)
(X^2 = 0.004 df = 1 P $>$0.90 in disability group II)
(X^2 = 3.134 df = 1 P $>$0.05 in disability group III)

A significant association exists between bronchospasm and disability, fewer men than expected with lesser and intermediate and more men than expected with severe disability exhibiting signs of bronchospasm.

(For men in all ages X^2 = 41.373 df = 2 P $<$0.01)
(Table LXXVI b.)

For women, age does not seem to be a significant factor in respect of bronchospasm.

(X^2 = 0.508 df = 1 P $>$0.30 in disability groups I + II)
(Table LXXVI a.)
(X^2 = 2.207 df = 1 P $>$0.10 in disability group III)

When the relation of bronchospasm to disability grading is considered for women, no significance can be demonstrated.

(For women in all ages X^2 = 5.409 df = 2 P $>$ 0.05)
(Table LXXVI b.)

2. MITRAL SYSTOLIC MURMURS

For men, the association of age with apical murmurs during systole shows no significance.

(X^2 = 0.687 df = 2 $P > 0.30$ in disability group I)
(Table LXXVII a.)
(X^2 = 2.361 df = 2 $P > 0.30$ in disability group II)
(X^2 = 5.386 df = 2 $P > 0.05$ in disability group III)

When the influence of disability is assessed with reference to mitral murmurs of grade III severity or less, no significance can be attributed for men.

(For men in all ages X^2 = 1.647 df = 4 $P > 0.80$)
(Table LXXVII b.)

For women also, age has no significant bearing on the prevalence of systolic apical murmurs in this series.

(X^2 = 3.428 df = 2 $P > 0.10$ in disability groups I + II)
(Table LXXVII a.)
(X^2 = 1.157 df = 2 $P > 0.50$ in disability group III)

When disability is considered in relation to grade of systolic murmur, no significance is attributable for women.

(For women in all ages X^2 = 4.402 df = 4 $P > 0.30$).
(Table LXXVII b.)

3. CYANOSIS

For men the relationship between age and blue colour shows significance only in the gross disability groups.

($X^2 = 1.191$ df = 1 $P > 0.20$ in disability group I)
(Table LXXVIII a.)
($X^2 = 2.200$ df = 1 $P > 0.10$ in disability group II)

($X^2 = 4.450$ df = 1 $P < 0.05$ in disability group III)

Significantly fewer younger men and more older men than expected show cyanosis in severe disability.

The association between cyanosis and disability itself reaches significant levels in each of the age groups for men. Fewer men with slight and intermediate disability and more men with severe disability than expected exhibit frank cyanosis.

(Younger men $X^2 = 4.075$ df = 1 $P < 0.05$) (Table LXXVIII b.)

(Older men $X^2 = 18.056$ df = 1 $P < 0.01$)

For women on the other hand, age does seem to play a significant role, fewer younger women and more older women than expected showing cyanosis.

($X^2 = 7.498$ df = 1 $P < 0.01$ in disability groups I + II)
(Table LXXVIII a.)
($X^2 = 7.508$ df = 1 $P < 0.01$ in disability group III)

On the contrary for women, no significance attaches to the influence of disability.

(Younger women $X^2 = 0.218$ df = 1 $P > 0.50$)
(Table LXXVIII b.)
(Older women $X^2 = 0.705$ df = 1 $P > 0.30$)

4. OEDEMA

For men it is doubtful if any reliable conclusion can be reached in the assessment of oedema of the extremities.

With reference to age no significance can be deduced.

(X^2 = nil after Yates' correction in disability group I)
(Table LXXIX a.)
(X^2 = 1.065 df = 1 P $>$0.30 in disability group II)
(X^2 = nil after Yates' correction in disability group III)

With regard to disability no significance is apparent in relation to the occurrence of oedema. Disability groups I and II have been combined for contrast with group III.

(For men in all ages X^2 = 1.756 df = 1 P $>$0.10) (Table LXXIX b.)

For women, there is some association between oedema and present age. In lesser disability no significance is seen but in severe disability levels of significance are reached, fewer younger women and more older women than expected exhibiting frank oedema.

(X^2 = 2.736 df = 1 P $>$0.05 in disability groups I + II)
(Table LXXIX a.)
(X^2 = 4.880 df = 1 P $<$0.05 in disability group III)

The relationship of disability with the occurrence of oedema has no significance for women.

(Younger women X^2 = 2.327 df = 2 P $>$0.30) (Table LXXIX b.)
(Older women X^2 = 0.297 df = 1 P $>$0.50)

5. CLUBBING OF FINGERS, BEAKING AND SPOONING OF NAILS

For men the relation of these signs relative to age shows no significance.

($X^2 = 0.618$ df = 1 $P > 0.30$ in disability group I)
(Table LXXX a.)
($X^2 = 0.015$ df = 1 $P > 0.90$ in disability group II)
($X^2 = 1.502$ df = 1 $P > 0.20$ in disability group III)

Their association with disability seems statistically significant. Fewer men with slight disability and more men than expected with severe or intermediate disability show any of these finger signs.

(For men in all ages $X^2 = 6.061$ df = 2 $P < 0.05$)
(Table LXXX b.)

For women, some relation to age can be demonstrated in lesser degrees of disability. Significantly fewer younger women and more older women than expected show clubbing, beaking or spooning. In severe disability it is not so.

($X^2 = 8.802$ df = 1 $P < 0.01$ in disability groups I + II)
(Table LXXX a.)
($X^2 = 0.002$ df = 1 $P > 0.95$ in disability group III)

The association between disability and the incidence of clubbing, etc. is not significant.

(Younger women $X^2 = 1.571$ df = 1 $P > 0.20$) (Table LXXX b.)
(Older women $X^2 = 2.060$ df = 1 $P > 0.10$)

6. RADIAL THICKNESS

For men the relative thickness of radial arteries shows a significant relation to age. Lesser thickness is associated with youth and greater thickness with older age in all disability groups except the most severe.

($X^2 = 4.066$ df = 1 $P < 0.05$ in disability group I)
(Table LXXXI a.)
($X^2 = 7.170$ df = 1 $P < 0.01$ in disability group II)

($X^2 = 0.003$ df = 1 $P > 0.95$ in disability group III)

Any association between radial thickness and degree of disability does not attain statistical significance.

(Younger men $X^2 = 1.719$ df = 2 $P > 0.30$) (Table LXXXI b.)

(Older men $X^2 = 5.326$ df = 2 $P > 0.05$)

For women also, significance is shown in the relationship of radial thickness to age in the lesser degree of disability. More younger women have lesser thickness and more older women than expected have greater thickness of radial arteries.

No such significance is seen in severe disability although the trend seems similar.

($X^2 = 15.634$ df = 1 $P < 0.01$ in disability groups I + II)
(Table LXXXI a.)
($X^2 = 1.668$ df = 1 $P > 0.20$ in disability group III)

When disability is considered in relation to radial artery thickness for women no significance is seen.

(Younger women $X^2 = 2.735$ df = 1 $P > 0.05$)(Table LXXXI b.)

(Older women $X^2 = 0.704$ df = 1 $P > 0.30$)

7. DEFICIENT DORSALIS PEDIS PULSATION ON ONE OR BOTH SIDES

For men, the relation of deficiency or absence of dorsalis pulse to age has no significance in any of the disability groups.

($X^2 = 0.123$ df = 1 $P > .70$ in disability group I)
(Table LXXXII a.)
($X^2 = 1.684$ df = 1 $P > .10$ in disability group II)
($X^2 = 0.781$ df = 1 $P > .30$ in disability group III)

Neither has the association between deficient dorsalis pedis pulses and disability from chronic bronchitis any statistical significance.

(For men in all ages $X^2 = 3.833$ df = 2 $P > .10$)
(Table LXXXII b.)

For women, the influence of present age shows no significance with regard to dorsalis pulsation deficiency.

($X^2 = 1.056$ df = 1 $P > .30$ in disability groups I + II)
(Table LXXXII a.)
($X^2 = 0.194$ df = 1 $P > .50$ in disability group III)

When disability itself is assessed with respect to deficiency of dorsalis pulsation in the foot no significance is forthcoming.

(For women in all ages $X^2 = 2.929$ df = 2 $P > .20$)
(Table LXXXII b.)

8. DEFICIENT POSTERIOR TIBIAL ARTERY PULSATION ON EITHER SIDE

For men, the relationship of diminished arterial pulsation at posterior tibial in the ankle to age, yields no statistical significance.

($X^2 = 0.016$ df = 1 $P > .80$ in disability group I)
(Table LXXXIII a.)
($X^2 = 2.865$ df = 1 $P > 0.05$ in disability group II)
($X^2 = 0.789$ df = 1 $P > .30$ in disability group III)

Any significance in the association between deficient pulsation at the ankle and disability is marginal.

(For men in all ages $X^2 = 6.685$ df = 2 $P < 0.05$)
(Table LXXXIII b.)

It appears that for both slight and severe disability there may be a reduction in posterior tibial pulsation whereas the reverse may be true for intermediate disability.

For women in this series, age is not significant as a factor relating to deficiency of ankle pulse.

($X^2 = 0.023$ df = 1 $P > .80$ in disability groups I + II)
(Table LXXXIII a.)
(X^2 = a mere fraction in disability group III)

When deficient posterior tibial pulsation is assessed with reference to disability no significance is shown.

(For women in all ages $X^2 = 0.168$ df = 2 $P > .50$)
(Table LXXXIII b.)

9. VARICOSITIES

For men, the relationship between the incidence of varicose veins and age is significant only in the least disability grade. Fewer younger men than expected and more older men than expected exhibit varicose veins in disability group I. No such conclusion can be drawn in disability groups II and III.

($X^2 = 7.313$ df = 1 $P < 0.01$ in disability group I)
(Table LXXXIV a.)
($X^2 = 0.080$ df = 1 $P > .70$ in disability group II)
($X^2 = 0.781$ df = 1 $P > .30$ in disability group III)

There is marginal significance attaching to disability in respect of varicosities for older age group but not for younger age group. In the older age group, fewer grossly disabled men and those with intermediate disability show varicosities and more slightly disabled men than expected do so.

(Younger men $X^2 = 0.599$ df = 1 $P > .30$) (Table LXXXIV b.)
(Older men $X^2 = 7.343$ df = 2 $P < 0.05$)

For women, the significance of age in relation to varicose veins is established in severe disability only, although the trend is general. The association is between the older years and the presence of varicose veins and conversely.

($X^2 = 3.206$ df = 1 $P > 0.05$ in disability groups I + II)
(Table LXXXIV a.)
($X^2 = 6.448$ df = 1 $P < 0.02$ in disability group III)

When varicosities are assessed in relation to disability, no significance can be traced.

(Younger women $X^2 = 3.558$ df = 2 $P > .10$)(Table LXXXIV b.)
(Older women $X^2 = 0.026$ df = 1 $P > .80$)

10. OPTIC FUNDUS

For men, the influence of age on the occurrence of fundal changes is only just significant in disability of intermediate grade, where more older men than expected and fewer younger men exhibit fundal abnormalities. No such conclusion can be drawn in the other disability grades.

($X^2 = 1.948$ df = 1 $P > .10$ in disability group I)
(Table LXXXV a.)
($X^2 = 5.058$ df = 1 $P < 0.05$ in disability group II)
($X^2 = 1.462$ df = 1 $P > .20$ in disability group III)

When fundal changes are considered with reference to disability no significance is seen.

(For men in all ages $X^2 = 1.561$ df = 2 $P > .30$)
(Table LXXXV b.)

For women, there is no significant association between abnormality of the fundus oculi and age.

($X^2 = 1.616$ df = 1 $P > .20$ in disability groups I + II)
(Table LXXXV a.)
($X^2 = 0.270$ df = 1 $P > .50$ in disability group III)

The occurrence of fundal changes bears no relation to disability in this series for women.

(For women in all ages $X^2 = 1.980$ df = 2 $P > .30$)
(Table LXXXV b.)

11. HERNIA

For men, there is an association between the occurrence of hernia at any site and present age, but significance is only established in slight disability. Fewer younger men and more older men than expected have present or previous hernia.

($X^2 = 5.397$ df = 1 $P < 0.05$ in disability group I)
(Table LXXXVI a.)
($X^2 = 0.292$ df = 1 $P > .50$ in disability group II)
($X^2 = 0.568$ df = 1 $P > .30$ in disability group III)

When the relation of hernia to disability itself is considered, no significance can be shown for men.

(For men in all ages $X^2 = 5.613$ df = 2 $P > 0.05$)
(Table LXXXVI b.)

For women, the influence of age has no statistical significance when considered with reference to the incidence of hernia.

(X^2 = nil after Yates' correction in disability groups I + II)
(Table LXXXVI a.)
($X^2 = 1.364$ df = 1 $P > .20$ in disability group III)

The relation of hernia to disability from chronic bronchitis for women, shows no significance.

(For women in all ages $X^2 = 3.138$ df = 1 $P > 0.05$)
(Table LXXXVI b.)

12. THYROID ABNORMALITIES

For men, except for an isolated individual in the older age group of disability group II, all thyroid abnormalities occur within disability group III. The influence of present age in severest disability is not significant.

($X^2 = 0.419$ df = 1 $P > .50$ in disability group III)
(Table LXXXVII a.)

For women, where numbers are more adequate for statistical analysis, the influence of age does not seem significant in relation to the occurrence of thyroid abnormality.

($X^2 = 0.017$ df = 1 $P > .80$ in disability groups I + II)
(Table LXXXVII a.)
($X^2 = 1.241$ df = 1 $P > .20$ in disability group III)

When the incidence of thyroid abnormality is considered in relation to disability, again no statistical significance can be inferred.

(For women in all ages $X^2 = 5.744$ df = 2 $P > 0.05$)
(Table LXXXVII b.)

DISCUSSION

OTHER PHYSICAL SIGNS

For men only, in all ages, significant associations exist between disability and bronchospasm, cyanosis and "clubbing" (widely interpreted), and also varicosities but only in older ages. Deficiency of either posterior tibial pulse seems related to the extremes of disability in all ages; and all the cases of thyroid abnormality for men have occurred in disability group III.

For women, on the other hand, no significant associations with disability are demonstrated under any of these headings.

NOTE ON AGE AND SEX DIFFERENCES

Differences in prevalence between the sexes parallel the mortality sex difference between the ages of 40 and 59 years. (Oswald 1958 and Stuart-Harris 1957). Nevertheless for similar age, occupation, exposure to infection and atmospheric pollution in addition to income, domestic circumstances and smoking habits, Oswald considers there are no significant differences between the sexes. He admits minor respiratory infections predominate in women leading to loss of time from work, but finds the more disabling stages commoner in men.

By contrast Fletcher et al. (1959) consider that disability is actually a less frequent consequence of chronic bronchitis in men than in women. There is an age gradient in men not seen in women, an increased prevalence of simple cough and sputum in men contrasting with women, and a significant fall of ventilatory capacity with symptoms not seen in women. Smoking habit differences do not wholly account for the sex differences. Occupation and air pollution are cited as possible factors, but in addition lesser susceptibility in women to the disabling consequences of bronchial hypersecretion and recurrent infection is postulated as the explanation.

The age gradient due to additional cases occurring throughout life has been referred to elsewhere. The work of Higgins confirms this in men but in women between the ages of 35 and 64 years no such gradient occurs in the prevalence of chronic bronchitis characterised by cough and sputum and chest illnesses. It may be that definitions because they vary or because they are too restrictive lead to unlikely results.

The survey of the College of General Practitioners (1961) shows an age gradient also for men which is not paralleled by the women, and an increased ratio of men to women with age. The "standard diagnosis" prevalences do not match those produced by the practitioners themselves but the trends are very similar.

TABLE I.

Numbers of men and women in the main study according to age and disability groups.

	Disability group I	Disability group II	Disability group III
MEN			
Younger age group	42	33	24
Older age group	33	70	156
Total	75	103	180
WOMEN			
Younger age group	28	61	35
Older age group	6	26	41
Total	34	87	76

TABLE I.

a.

Numbers of men and women in terms of admission of bronchitis, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	27	15	42	26	7	33	22	2	24
Older age group	22	11	33	34	36	70	121	35	156
Total	49	26	75	60	43	103	143	37	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	60	29	89	31	4	35
Older age group	23	9	32	35	6	41
Total	83	38	121	66	10	76

A = Number of individuals admitting bronchitis.

B = Number of individuals not admitting bronchitis.

T = Total number of individuals in group.

TABLE I.

b.

Numbers of men and women in terms of admission of bronchitis, by age and disability groups.

MEN

	Disability groups for younger age group			Disability groups for older age group			
	I	II+III	Total	I	II	III	Total
A	27	48	75	22	34	121	177
B	15	9	24	11	36	35	82
T	42	57	99	33	70	156	259

WOMEN

	Disability groups for all ages		
	I+II	III	Total
A	112	70	182
B	9	6	15
T	121	76	197

A = Number of individuals admitting bronchitis.

B = Number of individuals not admitting bronchitis.

T = Total number of individuals in group.

TABLE II.

a.

Numbers of men and women in terms of "phlegm in the morning at least in winter", by disability and age groups.

MEN	Disability group I			Disability groups II + III		
	A	B	T	A	B	T
Younger age group	41	1	42	54	3	57
Older age group	28	5	33	221	5	226
Total	69	6	75	275	8	283

WOMEN	Disability groups I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	84	5	89	33	2	35
Older age group	28	4	32	37	4	41
Total	112	9	121	70	6	76

A = Number of individuals admitting phlegm in the morning at least in winter.

B = Number of individuals not so admitting.

T = Total number of individuals in group.

TABLE II.

b.

Numbers of men and women in terms of "phlegm in the morning at least in winter", by age and disability groups.

MEN Disability groups for all ages.

	I	II+III	Total
A	69	275	344
B	6	8	14
T	75	283	358

WOMEN Disability groups for all ages

	I+II	III	Total
A	112	70	182
B	9	6	15
T	121	76	197

A = Number of individuals admitting phlegm in the morning at least in winter.

B = Number of individuals not so admitting.

T = Total number of individuals in group.

TABLE III.

a.

Numbers of men and women in terms of "sputum by day in winter", by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	38	4	42	19	14	33	19	5	24
Older age group	23	10	33	63	7	70	136	20	156
Total	61	14	75	82	21	103	155	25	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	75	14	89	27	8	35
Older age group	20	12	32	32	9	41
Total	95	26	121	59	17	76

A = Number of individuals admitting sputum by day in winter.

B = Number of individuals not admitting sputum by day in winter.

T = Total number of individuals in group.

TABLE III.

b.

Numbers of men and women in terms of "sputum by day in winter", by age and disability groups.

MEN	Disability groups for younger age group			Disability groups for older age group			
	I+II	III	Total	I	II	III	Total
A	57	19	76	23	63	136	222
B	18	5	23	10	7	20	37
T	75	24	99	33	70	156	259

WOMEN	Disability groups for all ages			
	I	II	III	Total
A	28	67	59	154
B	6	20	17	43
T	34	87	76	197

A = Number of individuals admitting phlegm in winter by day.

B = Number of individuals not admotting sputum by day in winter.

T = Total number of individuals in group.

TABLE IV.

a.

Numbers of men and women in terms of "cough and sputum for at least three months of the year", by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	40	2	42	28	5	33	23	1	24
Older age group	27	6	33	67	3	70	147	9	156
Total	67	8	75	95	8	103	170	10	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	80	9	89	32	3	35
Older age group	30	2	32	35	6	41
Total	110	11	121	67	9	76

A = Number of individuals admitting cough and sputum for at least three months of the year.

B = Number of individuals not admitting such persistence.

T = Total number of individuals in group.

TABLE IV.

b.

Numbers of men and women in terms of "cough and sputum for at least three months of the year", by age and disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
A	67	95	170	332
B	8	8	10	26
T	75	103	180	358

WOMEN — Disability groups for all ages

	I+II	III	Total
A	110	67	177
B	11	9	20
T	121	76	197

A = Number of individuals admitting cough and sputum at least three months of the year.

B = Number of individuals not admitting such persistence.

T = Total number of individuals in group.

TABLE V.

a.

Numbers of men and women in terms of duration of symptoms of at least two years, by disability and age groups, variously arranged.

MEN	Disability group I			Disability group II + III		
	A	B	T	A	B	T
Younger age group	41	1	42	54	3	57
Older age group	32	1	33	220	6	226
Total	73	2	75	274	9	283

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	84	5	89	34	1	35
Older age group	6	1	7	36	5	41
Total	90	6	96	70	6	76

A = Number of individuals admitting duration of symptoms of at least two years.

B = Number of individuals not admittinf such a duration.

T = Total number of individuals in group.

TABLE V.

b.

Numbers of men and women in terms of duration of symptoms of at least two years, for all ages by disability groups variously arranged.

MEN

	Disability groups for all ages		
	I+II	III	Total
A	171	176	347
B	7	4	11
T	178	180	358

WOMEN

	Disability groups for all ages		
	I+II	III	Total
A	115	70	185
B	6	6	12
T	121	76	197

A = Number of individuals admitting duration of at least two years.

B = Number of individuals not admitting duration of at least two years.

T = Total number of individuals in group.

TABLE VI.

a.

Numbers of men and women in terms of "noticeable" breathlessness, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	21	21	42	26	7	43	21	3	24
Older age group	22	11	33	64	6	70	147	9	156
Total	43	32	75	90	13	103	168	12	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	73	16	89	33	2	35
Older age group	29	3	32	40	1	41
Total	102	19	121	73	3	76

A = Number of individuals admitting noticeable breathlessness.

B = Number of individuals not admitting noticeable breathlessness.

T = Total number of individuals in group.

TABLE VI.

b.

Numbers of men and women in terms of "noticeable" breathlessness, in all ages by disability groups variously arranged.

MEN

Disability groups for all ages

	I	II	III	Total
A	43	90	168	301
B	32	13	12	57
T	75	103	180	358

WOMEN

Disability groups for all ages

	I	II+III	Total
A	24	151	175
B	10	12	22
T	34	163	197

A = Number of individuals admitting noticeable breathlessness.

B = Number of individuals not admitting noticeable breathlessness.

T = Total number of individuals in group.

TABLE VII.

a.

Numbers of men and women in terms of "noticeable" wheeziness, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	21	21	42	26	7	43	21	3	24
Older age group	22	11	33	64	6	70	147	9	156
Total	43	32	75	90	13	103	168	12	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	73	16	89	33	2	35
Older age group	29	3	32	40	1	41
Total	102	19	121	73	3	76

A = Number of individuals admitting noticeable wheeziness.

B = Number of individuals not admitting noticeable wheeziness.

T = Total number of individuals in group.

TABLE VII.

b.

Numbers of men and women in terms of "noticeable" wheeziness, by disability groups for the whole age range.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	66	87	171	324
B	9	16	9	34
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	III	III	Total
A	29	68	68	165
B	5	19	8	32
T	34	87	76	197

A = Number og individuals admitting noticeable wheeziness.

B = Number of individuals not admitting noticeable wheeziness.

T = Total number of individuals in group.

TABLE VIII.

a.

Numbers of men and women in terms of annual chest illness requiring bed, for the last three years by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	15	27	42	9	24	33	13	11	24
Older age group	12	21	33	27	43	70	68	88	156
Total	27	48	75	36	67	103	81	99	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	41	48	89	13	22	35
Older age group	13	19	32	17	24	41
Total	54	67	121	30	46	76

A = Number of individuals with annual chest illness requiring bed, for at least three years.

B = Number of individuals without annual chest illness history.

T = Total number of individuals in group.

TABLE VIII.

b.

Numbers of men and women in terms of annual chest illness requiring bed, for the last three years for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	27	36	81	144
B	48	67	99	214
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	18	36	30	84
B	16	51	46	113
T	34	87	76	197

A = Number of individuals with annual chest illness requiring bed, for at least three years.

B = Number of individuals without annual chest illness of three years history.

T = Total number of individuals in group.

TABLE IX.

a.

Numbers of men and women in terms of recurring chestiness without requiring resort to bed, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	25	17	42	15	18	33	12	12	24
Older age group	13	20	33	30	40	70	66	90	156
Total	38	37	75	45	58	103	78	102	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	43	46	89	17	18	35
Older age group	17	15	32	22	19	41
Total	60	61	121	39	37	76

A = Number of individuals with recurring chestiness not requiring bed.

B = Number of individuals without recurring chestiness of this degree.

T = Total numberoof individuals in group.

TABLE IX.

b.

Numbers of men and women in terms of recurring chestiness without requiring bed, for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	38	45	78	161
B	37	58	102	197
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	25	60	58	143
B	9	25	16	50
T	34	85	74	193

A = Number of individuals with recurring chestiness not requiring bed.

B = Number of individuals without such recurring chestiness.

T = Total number of individuals in group.

TABLE X.

a.

Numbers of men and women in terms of father's social class, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	26	16	42	22	10	32	19	5	24
Older age group	30	3	33	58	12	70	131	25	156
Total	56	19	75	80	22	102	150	30	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	60	27	87	25	9	34
Older age group	25	7	32	33	7	40
Total	85	34	119	58	16	74

A = Number of individuals whose fathers come from Social Class I II and III.

B = Number of individuals whose fathers belong to Social Class IV and V.

T = Total number of individuals in group.

TABLE X.

b.

Numbers of men and women in terms of father's social class, by age and disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group		
	I	II	III	Total	I+II	III	Total
A	26	22	19	67	88	131	219
B	16	10	5	31	15	25	40
T	42	32	24	98	103	156	259

WOMEN	Disability groups for all ages			
	I	II	III	Total
A	25	60	58	143
B	9	25	16	50
T	34	85	74	193

A = Number of individuals whose father's Social Class is I II or III.

B = Number of individuals whose father's Social Class is IV or V.

T = Total number of individuals in group.

TABLE X.

C.

Numbers of men and women in terms of father's social class, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	3	39	42	4	28	32	4	20	24
Older age group	9	24	33	6	64	70	12	144	156
Total	12	63	75	10	92	102	16	164	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	4	83	87	2	32	34
Older age group	3	29	32	2	38	40
Total	7	112	119	4	70	74

A = Number of individuals whose father's Social Class is I or II.

B = Number of individuals whose father's Social Class is III IV or V.

T = Total number of individuals in group.

TABLE X.

d.

Numbers of men and women in terms of father's social class, by age and disability groups.

MEN

	Disability groups for younger age group			Disability groups for older age group			
	I+II	III	Total	I	II	III	Total
A	7	4	11	9	6	12	27
B	67	20	87	24	64	144	232
T	74	24	98	33	70	156	259

WOMEN

	Disability groups for all ages		
	I+II	III	Total
A	7	4	11
B	112	70	182
T	119	74	193

A = Number of individuals whose father's Social Class is I or II.

B = Number of individuals whose father's Social Class is III IV or V.

T = Total number of individuals in group.

TABLE XI.

a.

Numbers of men and women in terms of regularity of work of father in youth, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	10	32	42	7	26	33	6	18	24
Older age group	6	27	33	4	66	70	19	137	156
Total	16	59	75	11	92	103	25	155	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	28	61	89	11	24	35
Older age group	5	27	32	11	30	41
Total	33	88	121	22	54	76

A = Number of individuals whose fathers were not in regular work.

B = Number of individuals who do not admit such a handicap.

T = Total number of individuals in group.

TABLE XI.

b.

Numbers of men and women in terms of father's lack of regular work in youth, for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	16	11	25	52
B	59	92	155	306
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	10	23	22	55
B	24	64	54	142
T	34	87	76	197

A = Number of individuals whose fathers lacked regular work in youth.

B = Number of individuals whose fathers did not lack regular work.

T = Total number of individuals in group.

TABLE XII.

a.

Numbers of men and women in terms of working mother when young, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	18	24	42	8	25	33	8	16	24
Older age group	7	26	33	15	55	70	35	121	156
Total	25	50	75	23	80	103	43	137	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	26	63	89	9	26	35
Older age group	5	27	32	16	25	41
Total	31	90	121	25	51	76

A = Number of individuals with working mother when young.

B = Number of individuals without working mother when young.

T = Total number of individuals in group.

TABLE XII.

b.

Numbers of men and women in terms of working mother when young, for the whole age range by disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
A	25	23	43	91
B	50	80	137	267
T	75	103	180	358

WOMEN — Disability groups for allages

	I	II	III	Total
A	10	21	25	56
B	24	66	51	141
T	34	87	76	197

A = Number of individuals with working mother when young.

B = Number of individuals without working mother when young.

T = Total number of individuals in group.

TABLE XIII.

a.

Numbers of men and women in terms of patient's educational standard, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	20	22	42	21	12	33	21	3	24
Older age group	19	14	33	54	16	70	122	34	156
Total	39	36	75	75	28	103	143	37	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	58	31	89	30	5	35
Older age group	20	12	32	37	4	41
Total	78	43	121	67	9	76

A = Number of individuals with lesser educational standard.

B = Number of individuals with greater wducational standard.

T = Total number of individuals in group.

TABLE XIII.

b.

Numbers of men and women in terms of patient's educational standard, for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	39	75	143	257
B	36	28	37	101
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	19	59	61	145
B	15	28	9	52
T	34	87	76	197

A = Number of individuals with lesser educational attainments.

B = Number of individuals with greater educational attainments.

T = Total number of individuals in group.

TABLE XIV.

a.

Numbers of men and women in terms of appreciable loss of schooling from illness when young, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	15	27	42	13	20	33	4	20	24
Older age group	8	25	33	12	58	70	43	113	156
Total	23	52	75	25	78	103	47	133	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	ZA	B	T
Younger age group	33	56	89	18	17	35
Older age group	9	23	32	12	29	41
Total	42	79	121	30	46	76

A = Number of individuals with appreciable loss of schooling.

B = Number of individuals without appreciable loss of schooling.

T = Total number of individuals in group.

TABLE XIV.

b.

Numbers of men and women in terms of appreciable loss of schooling, by age and disability groups, variously arranged.

MEN	Disability groups for younger age group			Disability groups for older age group			
	I	II+III	Total	I	II	III	Total
A	15	17	32	8	12	43	63
B	27	40	67	25	58	113	196
T	42	57	99	33	70	156	259

WOMEN	Disability groups for younger age group			Disability groups for older age group		
	I+II	III	Total	I+II	III	Total
A	33	18	51	9	12	21
B	56	17	73	23	29	52
T	89	35	124	32	41	73

A = Number of individuals with appreciable loss of schooling.

B = Number of individuals without appreciable loss of schooling.

T = Total number of individuals in group.

TABLE XV.

a.

Numbers of men and women in terms of delay in starting work till after 15 years, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	12	30	42	8	25	33	3	21	24
Older age group	10	23	33	6	64	70	13	143	156
Total	22	53	75	14	89	103	16	164	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	34	55	89	11	24	35
Older age group	9	23	32	8	33	41
Total	43	78	121	19	57	76

A = Number of individuals who began work after 15 years due to illness.

B = Number of individuals who did not begin work after 15 years.

T = Total number of individuals in group.

TABLE XV.

b.

Numbers of men and women in terms of delay in starting work till after 15 years, by age and disability groups variously combined.

MEN	Disability groups for younger age group			Disability groups for older age group			
	I	II + III	Total	I	II	III	Total
A	12	11	23	10	6	13	29
B	30	45	75	23	64	143	230
T	42	56	98	33	70	156	259

WOMEN	Disability groups for all ages			
	I	II	III	Total
A	17	26	19	62
B	17	61	57	135
T	34	87	76	197

A = Number of individuals starting work after 15 years due to illness.

B = Number of individuals not starting work after 15 years.

T = Total number of individuals in group.

TABLE XVI.

a.

Numbers of men and women in terms of exposure to dust at work, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	24	18	42	25	9	34	16	10	26
Older age group	20	16	36	55	18	73	112	44	156
Total	44	34	78	80	27	107	128	54	182

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	19	77	96	9	26	35
Older age group	3	28	31	10	30	40
Total	22	105	127	19	56	75

A = Number of individuals claiming exposure to dust at work.

B = Number of individuals not claiming exposure to dust at work.

T = Total number of individuals in group.

TABLE XVI.

b.

Numbers of men and women in terms of exposure to dust at work, by disability groups for the whole age range.

MEN — Disability groups for all ages

	I	II	III	Total
A	44	80	128	252
B	34	27	54	115
T	78	107	182	367

WOMEN — Disability groups for all ages

	I	II	III	Total
A	10	12	19	41
B	29	76	56	161
T	39	88	75	202

A = Number of individuals who claim exposure to dust at work.

B = Number of individuals who do not claim exposure to dust at work.

T = Total number of individuals in group.

TABLE XVII.

a.

Numbers of men and women in terms of exposure to draughts at work, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	19	23	42	13	21	34	12	14	26
Older age group	19	17	36	44	29	73	87	69	156
Total	38	40	78	57	50	107	99	83	182

WOMEN Too few cases for analysis.

A = Number of individuals claiming exposure to draughts at work.

B = Number of individuals not claiming exposure to draughts at work.

T = Total number of individuals in group.

TABLE XVII.

b.

Numbers of men and women in terms of exposure to draughts at work, by age and disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	19	13	12	44	19	44	87	150
B	23	21	14	58	17	29	69	115
T	42	34	26	102	36	73	156	265

WOMEN	Disability groups for all ages			
	I	II	III	Total
A	9	13	14	36
B	30	75	61	166
T	39	88	75	202

A = Number of individuals claiming exposure to draughts at work.

B = Number of individuals not claiming exposure to draughts at work.

T = Total number of individuals in group.

TABLE XVIII.

a.

Numbers of men and women in terms of exposure to wet conditions at work, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	18	24	42	12	22	34	16	10	26
Older age group	12	24	36	46	27	73	84	72	156
Total	30	48	78	58	49	107	100	82	182

WOMEN Too few cases to allow analysis.

A = Number of individuals claiming exposure to wet conditions at work.

B = Number of individuals not claiming exposure to wet conditions.

T = Total number of individuals in group.

TABLE XVIII.

b.

Numbers of men and women in terms of exposure to wet conditions at work, by age and disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	18	12	16	46	12	46	84	142
B	24	22	10	56	24	27	72	123
T	42	34	26	102	36	73	156	265

WOMEN	Disability groups for all ages			
	I	II	III	Total
A	5	24	20	49
B	34	64	55	153
T	39	88	75	202

A = Number of individuals claiming exposure to wet conditions at work.

B = Number of individuals not claiming exposure to wet conditions.

T = Total number of individuals in group.

TABLE XIX.

a.

Numbers of men and women in terms of extremes of temperature at work, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	9	33	42	8	26	34	9	17	26
Older age group	7	29	36	20	53	73	36	120	156
Total	16	62	78	28	79	107	45	137	182

WOMEN Insufficient numbers to allow analysis.

b.

Numbers of men in terms of extremes of temperature at work, for all ages by disability groups.

MEN Disability groups for all ages

	I	II	III	Total
A	16	28	45	89
B	62	79	137	278
T	78	107	182	367

A = Number of individuals claiming exposure to extremes of temperature.
B = Number of individuals not claiming such exposure.
T = Total number of individuals in group.

TABLE XX.

a.

Numbers of men in terms of cold conditions at work, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	7	35	42	3	31	34	4	22	26
Older age group	2	34	36	16	57	73	36	120	156
Total	9	69	78	19	88	107	40	142	182

Numbers of women insufficient for analysis.

A = Number of individuals claiming exposure to cold conditions at work.

B = Number of individuals not claiming exposure to cold.

T = Total number of individuals in group.

TABLE XX.

b.

Numbers of men and women in terms of exposure to cold at work, for the whole age range by disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
A	9	19	40	68
B	69	88	142	299
T	78	107	182	367

WOMEN — Disability groups for all ages

	I	II	III	Total
A	5	6	7	18
B	34	82	68	184
T	39	88	75	202

A = Number of individuals claiming exposure to cold at work.

B = Number of individuals not claiming exposure to cold at work.

T = Total number of individuals in group.

TABLE XXI.

a.

Numbers of men in terms of exposure to fumes at work, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	5	37	42	5	29	34	1	25	26
Older age group	3	33	36	3	70	73	7	149	156
Total	8	70	78	8	99	107	8	174	182

Numbers of women insufficient for analysis.

A = Number of individuals claiming exposure to objectionable fumes.

B = Number of individuals not claiming exposure to fumes at work.

T = Total number of individuals in group.

TABLE XXI.

b.

Numbers of men interms of exposure to fumes at work, by disability groups for the whole age range.

MEN Disability groups for all ages

	I	II	III	Total
A	8	8	8	24
B	70	99	174	343
T	78	107	182	367

WOMEN The numbers are insufficient to allow analysis.

A = Number of individuals claiming exposure to fumes at work.

B = Number of individuals not claiming exposure to fumes at work.

T = Total number if individuals in group.

TABLE XXII.

a.

Numbers of men and women in terms of indoor work principally, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	24	18	42	14	18	33	9	14	24
Older age group	18	15	33	25	45	70	54	102	156
Total	42	33	75	39	64	103	63	117	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	88	1	89	33	2	35
Older age group	31	1	32	39	2	41
Total	119	2	121	72	4	76

A = Number of individuals working principally indoors throughout working life.

B = Number of individuals not working principally indoors.

T = Total number of individuals in group.

TABLE XXII.

b.

Numbers of men and women in terms of indoor work principally, for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	42	39	63	149
B	33	64	117	214
T	75	103	180	358

WOMEN

	Disability groups for all ages		
	I + II	III	Total
A	119	72	191
B	2	4	6
T	121	76	197

A = Number of individuals with indoor work history principally.

B = Number of individuals without a principally indoor work history.

T = Total number of individuals in group.

TABLE XXII.

c.

Numbers of men in terms of indoor work, in a straight contrast with outdoor conditions, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	24	18	42	14	18	32	8	13	21
Older age group	18	13	31	25	17	42	54	64	118
Total	42	31	73	39	35	74	62	77	139

d.

Numbers of men interms of indoor work, in a straight contrast with outdoor conditions, for the whole age range by disability groups.

MEN	Disability groups for all ages			
	I	II	III	Total
A	42	39	62	143
B	31	35	77	143
T	73	74	139	286

A = Number of individuals with a predominantly indoor work history.

B = Number of individuals with a predominantly outdoor work history.

T = Total number of individuals in group.

TABLE XXIII.

a.

Numbers of men in terms of outdoor working conditions, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	18	24	42	18	14	33	14	10	24
Older age group	13	20	33	18	52	70	64	92	156
Total	31	44	75	36	67	103	78	102	180

Apart from a single underground worker, numbers of women are complementary to indoor work numbers.

b.

Numbers of men in terms of outdoor working conditions, by age and disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	18	18	14	50	13	18	64	95
B	24	15	10	49	20	52	92	164
T	42	33	24	99	33	70	156	259

A = Number of individuals with indoor work history principally.
B = Number of individuals without outdoor work history principally.
T = Total number of individuals in group.

TABLE XXIV.

a.

Numbers of men and women in terms of underground work, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	-	42		1	32	33	2	22	24
Older age group	2	31		28	42	70	42	114	156
Total				29	74	103	44	136	180

Only one woman, in the older age group and disability group III has worked underground.

b.

Numbers of men in terms of underground work, by disability groups for the older age group. Insufficient numbers in younger ages for analysis.

MEN	Disability groups for older age group		
	I+II	III	Total
A	30	42	72
B	42	145	187
T	72	187	259

A = Number of individuals subjected to underground working conditions.
B = Number of indifiduals not subjected to underground conditions.
T = Total number of individuals in group.

TABLE XXV.

a.

Numbers of men and women in terms of Patient's own highest social grading, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	32	10	42	25	8	33	17	7	24
Older age group	24	9	33	58	12	70	127	29	156
Total	56	19	75	83	20	103	144	36	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	66	23	89	22	13	35
Older age group	30	2	32	32	9	41
Total	96	25	121	54	22	76

A = Number of individuals attaining Social Class I II or III at any time.

B = Number of individuals never above Social Class IV or V.

T = Total number of individuals in group.

TABLE XXV.

b.

Numbers of men and women in terms of patient's own social grading, by age and disability groups.

MEN

Disability groups for whole age range

	I	II	III	Total
A	56	83	144	283
B	19	20	36	75
T	75	103	180	358

Disability groups for older age group only

	I	II	III	Total
C	8	8	25	41
D	16	50	102	168
E	9	12	29	50
T	33	70	156	259

WOMEN

Disability groups for all ages

	I	II	III	Total
A	28	68	54	150
B	6	19	22	47
T	34	87	76	197

A = Number of individuals in social class I II or III.
B = Number of individuals never higher than social class IV or V.
T = Total number of individuals in group.
C = Number of individuals in social class I or II.
D = Number of individuals in social class III but never higher.
E = Number of individuals in social class IV or V but never higher.

TABLE XXV.

c.

Numbers of men and women in terms of patient's own social grading, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	5	37	42	2	31	33	1	23	24
Older age group	8	25	33	8	62	70	25	131	156
Total	13	62	75	10	93	103	26	154	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	10	79	89	2	33	35
Older age group	7	25	32	7	34	41
Total	17	104	121	9	67	76

A = Number of individuals attaining social class I or II at any time.

B = Number of individuals attaining no higher social class than III IV or V.

T = Total number of individuals in group.

TABLE XXV.

d.

Numbers of men and women in terms of patient's own social class, by age and disability groups.

MEN	Disability groups for younger age group			Disability groups, for older age group			
	I	II+III	Total	I	II	III	Total
A	5	3	8	8	8	25	41
B	37	54	91	25	62	131	218
T	42	57	99	33	70	156	259

WOMEN	Disability groups for all ages			
	I	II	III	Total
A	5	12	9	26
B	29	75	67	171
T	34	87	76	197

A = Number of individuals attaining social class I or II at some time.

B = Number of individuals attaining social class no higher than III IV or V.

T = Total number of individuals in group.

TABLE XXV.

e.

Numbers of men in terms of patient's own social grading, by age groups in disability group I.

MEN	Disability group I			
	A	B	C	T
Younger age group	5	27	10	42
Older age group	8	16	9	33
Total	13	43	19	75

f.

Numbers of women in terms of patient's own social class, by age groups and disability groups variously combined.

WOMEN	Disability groups for younger age group				Disability groups for older age group		
	I	II	III	Total	I+II	III	Total
D	22	44	22	88	30	32	62
E	6	17	13	36	2	9	11
T	28	61	35	124	32	41	73

A = Number of individuals in social class I or II.
B = Number of individuals in social class III.
C = Number of individuals in social class IV or V.
T = Total number of individuals in group.
D = Number of individuals in social class I II or III.
E = Number of individuals in social class IV or V.

TABLE XXVI.

a.

Numbers of men and women in terms of frequent changes of employment, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	16	26	42	9	24	33	9	15	24
Older age group	8	25	33	13	57	70	24	132	156
Total	24	51	75	22	81	103	33	147	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	9	80	89	6	29	35
Older age group	2	30	32	5	36	41
Total	11	110	121	11	65	76

A = Number of individuals with unsettled employment history.

B = Number of individuals without an unsettled employment history.

T = Total number of individuals in group.

TABLE XXVI.

b.

Numbers of men and women in terms of frequent changes of employment, by age and disability groups.

MEN	Disability groups for younger age group				Disability groups, for older age group			
	I	II	III	Total	I	II	III	Total
A	16	9	9	34	8	13	24	45
B	26	24	15	65	25	57	132	214
T	42	33	24	99	33	70	156	259

WOMEN	Disability groups for all ages			
	I	II	III	Total
A	5	6	11	22
B	29	81	65	175
T	34	87	76	197

A = Number of individuals in employment of no settled type.

B = Number of individuals without unsettled employment history.

T = Total number of individuals in group.

TABLE XXVII.

a.

Numbers of men and women in terms of travel in smoking compartments, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	18	24	42	16	17	33	10	14	24
Older age group	15	18	33	30	40	70	63	93	156
Total	33	42	75	46	57	103	73	107	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	23	66	89	8	27	35
Older age group	8	24	32	10	31	41
Total	31	90	121	18	58	76

A = Number of individuals admitting regular travel in "smoker" for daily minimum of half hour.

B = Number of individuals admitting no such history.

T = Total number of individuals in group.

TABLE XXVII.

b.

Numbers of men and women in terms of travel in smoking compartments, by disability groups for the whole age range.

MEN — Disability groups for all ages

	I	II	III	Total
A	33	46	73	152
B	42	57	107	206
T	75	103	180	358

WOMEN — Disability groups for all ages

	I	II	III	Total
A	11	20	18	49
B	23	67	58	148
T	34	87	76	197

A = Number of individuals admitting regular travel in "smoker" for daily minimum of half hour.

B = Number of individuals not admitting such a history.

T = Total number of individuals in group.

TABLE XXVIII.

a.

Numbers of men and women in terms of width of interests, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	30	12	42	25	8	33	15	9	24
Older age group	12	21	33	50	20	70	96	60	156
Total	42	33	75	75	28	103	111	69	180

WOMEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	16	12	28	32	29	61	13	22	35
Older age group	5	1	6	13	13	26	22	19	41
Total	21	13	34	45	42	87	35	41	76

A = Number of individuals with wider outside interests than average.

B = Number of individuals not having wider than average interests.

T = Total number of individuals in group.

TABLE XXVIII.

b.

Numbers of men and women in terms of width of outside interests, by disability and age groups where applicable.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	30	25	15	70	12	50	96	158
B	12	8	9	29	21	20	60	101
T	42	33	24	99	33	70	156	259

WOMEN	Disability groups for all ages			
	I	II	III	Total
A	21	45	35	101
B	13	42	41	96
T	34	87	76	197

A = Number of individuals with wider than average outside interests.

B = Number of individuals not having wider than average interests.

T = Total number of individuals in group.

TABLE XXIX.

a.

Numbers of men and women on terms of age at marriage, by disability and age groups.

MEN	Disability group I			Disability group II				Disability group III		
	A	B	T	A	C	D	T	A	B	T
Younger age group	22	9	31	15	8	8	31	8	14	22
Older age group	9	24	33	31	14	23	68	48	90	138
Total	31	33	64	46	22	31	99	56	104	160

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	51	18	69	23	8	31
Older age group	9	16	25	21	14	35
Total	60	34	94	44	22	66

A = Number of individuals married at ages 15-24 years.
B = Number of individuals married at ages 25 years and more.
T = Total number of individuals in group.
C = Number of individuals married at ages 25-29 years.
D = Number of individuals married at ages 30 years and more.

TABLE XXIX.

b.

Numbers of men and women in terms of age at marriage, by age and disability groups.

MEN	Disability groups for younger age group					Disability groups for older age group			
	I	II	III	Total		I	II	III	Total
A	22	15	8	45	A	9	31	48	88
B	9	16	14	39	C	10	14	42	66
T	31	31	22	84	E	7	10	33	50
					F	7	13	15	35
					T	33	68	138	239

WOMEN	Disability groups for younger age group				Disability groups for older age group		
	I	II	III	Total	I + II	III	Total
A	10	41	23	74	9	21	30
B	7	11	8	26	16	14	30
T	17	52	31	100	25	35	60

A = Number of individuals married at ages 15-24 years.
B = Number of individuals married at ages 25 years and more.
C = Number of individuals married at ages 25 -29 years.
E = Number of individuals married at ages 30 -34 years.
F = Number of individuals married at ages 35 years and more.
T = Total number of individuals in group.

TABLE XXX.

Numbers of men and women in terms of marital status, by age groups.

MEN	Single	Married	Total
Younger age group	15	84	99
Older age group	22	237	259
Total	37	321	358

WOMEN	Single	Married	Total
Younger age group	24	100	124
Older age group	13	60	73
Total	37	160	197

TABLE XXX.

a.

Numbers of men and women in terms of marital status, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	S	M	T	S	M	T	S	M	T
Younger age group	11	31	42	2	31	33	2	22	24
Older age group	2	31	33	2	68	70	18	138	156
Total	13	62	75	4	99	103	20	160	180

WOMEN	Disability group I + II			Disability group. III		
	S	M	T	S	M	T
Younger age group	20	69	89	4	31	35
Older age group	7	25	32	6	35	41
Total	27	94	121	10	66	76

S = Number of individuals who have never been married.

M = Number of individuals who have been married and lived at least a

T = Total number of individuals in group. (period of years with spouse.

TABLE XXX.

b.

Numbers of men and women in terms of marital status, by age and disability groups variously combined.

MEN	Disability groups for younger age group			Disability groups for older age group		
	I	II + III	Total	I + II	III	Total
S	11	4	15	4	18	22
M	31	53	84	99	138	237
T	42	57	99	103	156	259

WOMEN	Disability groups for all ages			
	I	II	III	Total
S	13	14	10	37
M	21	73	66	161
T	34	87	76	197

S = Number of individuals who have never been married.

M = Number of individuals who have been married, living a period

T = Total number of individuals in groupof years at least, with spouse.

TABLE XXXI.

a.

Numbers of men and women in terms of number of rooms occupied in home, by disability and age groups.

MEN	Disability group I				Disability group II			Disability group III		
	A	B	C	T	D	C	T	D	C	T
Younger age group	5	18	19	42	15	18	33	11	13	24
Older age group	6	14	13	33	36	34	70	55	101	156
Total	11	32	32	75	51	52	103	66	114	180

WOMEN	Disability group I + II			Disability group III		
	D	C	T	D	C	T
Younger age group	49	40	89	17	18	35
Older age group	21	11	32	21	20	41
Total	70	51	121	38	38	76

A = Number of individuals in houses of four rooms or more, on average.
B = Number of individuals in houses of three rooms , on average.
C = Number of individuals in houses of one or two rooms, on average.
T = Total number of individuals in group.
D = Number of individuals in houses of three or more rooms, on average.

TABLE XXXI.

b.

Numbers of men and women in terms of number of rooms in house occupied, for the whole age range by disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
D	43	51	66	160
C	32	52	114	198
T	75	103	180	358

WOMEN — Disability groups for all ages

	I	II	III	Total
D	20	50	38	108
C	14	37	38	89
T	34	87	76	197

D = Number of individuals in houses of three rooms or more, on average.

C = Number of individuals in houses of one or two rooms, on average.

T = Total number of individuals in group.

TABLE XXXII.

a.

Numbers of men and women in terms of number of individuals in household, by disability and age groups.

MEN	Disability group I				Disability group II				Disability group III			
	A	B	C	T	A	B	C	T	A	B	C	T
Younger age group	9	16	17	42	6	11	16	33	6	9	9	24
Older age group	5	8	20	33	20	30	20	70	21	71	64	156
Total	14	24	37	75	26	41	36	103	27	80	73	180

WOMEN	Disability group I + II				Disability group III			
	D	E	F	T	D	E	F	T
Younger age group	23	51	15	89	13	15	7	35
Older age group	9	15	8	32	8	23	10	41
Total	32	66	23	121	21	38	17	76

A = Number of individuals in household of eight or more.
B = Number of individuals in household of six or seven, on average.
C = Number of individuals in household of three to five, on average.
T = Total number of individuals in group.
D = Number of individuals in household of seven or more, on average.
E = Number of individuals in household of five or six, on average.
F = Number of individuals in household of three or four, on average.

TABLE XXXII.

b.

Numbers of men and women in terms of number of individuals in household, by disability groups for the whole age range.

MEN — Disability groups for all afes

	I	II	III	Total
A	14	26	27	67
B	24	41	80	145
C	37	36	73	146
T	75	103	180	358

WOMEN — Disability groups for all ages

	I	II	III	Total
D	6	26	21	53
E	21	45	38	104
F	7	16	17	40
T	34	87	76	197

A = Number of individuals in household of eight or more, on average.
B = Number of individuals in household of six or seven, on average.
C = Number of individuals in household of three to five, on average.
T = Total number of individuals in group.
D = Number of individuals in household of seven or more, on average.
E = Number of individuals in household of five or six, on average.
F = Number of individuals in household of three or four, on average.

TABLE XXXIII.

a.

Numbers of men and women in terms of insanitary housing, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	19	23	42	20	13	33	15	9	24
Older age group	13	20	33	28	42	70	61	95	156
Total	32	43	75	48	55	103	76	104	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	51	38	89	20	15	35
Olfer age group	8	24	32	16	25	41
Total	59	62	121	36	40	76

A = Number of individuals with insanitary housing history (damp or unsound)

B = Number of individuals without such a history.

T = Total number of individuals in group.

TABLE XXXIII.

b.

Numbers of men and women in terms of insanitary housing, by age and disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	19	20	15	54	13	28	61	102
B	23	13	9	45	20	42	95	157
T	42	33	24	99	33	70	156	259

WOMEN	Disability groups for younger age group				Disability groups for older age group		
	I	II	III	Total	I + II	III	Total
A	14	37	20	71	8	16	24
B	14	24	15	53	24	25	49
T	28	61	35	124	32	41	73

A = Number of individuals with history of insanitary housing.

B = Number of individuals without such a history.

T = Total number of individuals in group.

TABLE XXXIV.

a.

Numbers of men and women in terms of ratio of persons to rooms in household, by disability and age groups.

MEN	Disability group I				Disability group II				Disability group III			
	1-3	4,5	6+	T	1-3	4,5	6+	T	1-4	5,6	7+	T
Younger age group	9	22	11	42	8	16	9	33	13	6	5	24
Older age group	13	12	8	33	9	32	29	70	60	62	34	156
Total	22	34	19	75	17	48	38	103	73	68	39	180

WOMEN	Disability group I + II				Disability group III			
	1-3	4,5	6+	T	1-3	4,5	6+	T
Younger age group	24	42	23	89	7	15	13	35
Older age group	16	9	7	32	17	15	9	41
Total	40	51	30	121	24	30	22	76

Ratio of persons to rooms (both on average) is coded as follows:

1	1+	1½+	2+	2½+	3+	3½+	4+	4½+	5+	5½+	6+	Ratio
1	2	3	4	5	6	7	8	9	10	11	12	Code

TABLE XXXIV.

b.

Numbers of men and women in terms of ratio of persons to rooms in household, for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
1-3	22	17	38	77
4,5	34	48	66	148
6+	19	38	76	133
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
1-3	12	28	24	64
4,5	15	36	30	81
6+	7	23	22	52
T	34	87	76	197

Ratio of persons to rooms in household is coded as follows:

Ratio	1	1+	1½+	2+	2½+	3+	3½+	4+	4½+	5+	5½+	6+	6½+
Code	1	2	3	4	5	6	7	8	9	10	11	12	13

TABLE XXXV.

a.

Numbers of men and women in terms of number of changes of domicile, by disability and age groups.

MEN	Disability group I				Disability group II				Disability group III			
	0-3	4,5	6+	T	0-3	4,5	6+	T	0-2	3,4	5+	T
Younger age group	23	13	6	42	14	7	12	33	5	11	8	24
Older age group	9	10	14	33	10	25	35	70	22	45	89	156
Total	32	23	20	75	24	32	47	103	27	56	97	180

WOMEN	Disability group I + II				Disability group III			
	0-3	4-6	7+	T	0-3	4-6	7+	T
Younger age group	45	36	8	89	19	11	5	35
Older age group	7	15	10	32	9	18	14	41
Total	52	51	18	121	28	29	19	76

The number of individuals experiencing removals to the actual number shown appears under these numbers in various groupings, e.g. 4-6 means 4,5 or 6 removals during whole life experience.

TABLE XXXV.

b.

Numbers of men and women in terms of number of changes of domicile, by age and disability groups.

MEN

	Disability groups for younger age group					Disability groups for older age group			
	I	II	III	Total		I	II	III	Total
0-2	16	9	5	30	0-3	9	10	43	62
3,4	11	9	11	31	4,5	10	25	52	87
5+	15	15	8	38	6,7	8	19	36	63
T	42	33	24	99	8+	6	16	25	47
					T	33	70	156	259

WOMEN

	Disability groups for younger age group			Disability groups for older age group		
	I + II	III	Total	I + II	III	Total
0-3	45	19	64	7	9	16
4-6	36	11	47	15	18	33
7+	8	5	13	10	14	24
T	89	35	124	32	41	73

Actual number of changes of domicile are shown in various groupings to suit the data recorded. Only two women and five men have never removed, but three women and fourteen men have moved more than ten times.

T = Total number of individuals in group.

TABLE XXXVI.

a.

Numbers of men and women in terms of conditions of social hardship in childhood, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	25	17	42	24	9	33	18	6	24
Older age group	21	12	33	57	13	70	121	35	156
Total	46	29	75	81	22	103	139	41	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	38	51	89	17	18	35
Older age group	16	16	32	19	22	41
Total	54	67	121	36	40	76

A = Number of individuals giving history of "bare feet" and "no holidays".

B = Number of individuals not admitting childhood hardship.

T = Total number of individuals in group.

TABLE XXXVI.

b.

Numbers of men and women in terms of conditions of social hardship in childhood, for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	46	81	139	266
B	29	22	41	92
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	13	41	36	90
B	21	46	40	107
T	34	87	76	197

A = Number of individuals giving history of "bare feet""no holidays" or
B = Number of individuals with no such history. (poor parental care.
T = Total number of individuals in group.

TABLE XXXVII.

a.

Numbers of men and women in terms of seniority index within family, by disability and age groups.

MEN	Disability group I				Disability group II				Disability group III			
	A	B	C	T	A	B	C	T	A	B	C	T
Younger age group	19	20	3	42	15	13	4	32	10	5	9	24
Older age group	15	8	10	33	27	27	16	70	58	58	40	156
Total	34	28	13	75	42	40	20	102	68	63	49	180

WOMEN	Disability group I + II				Disability group III			
	A	B	C	T	A	B	C	T
Younger age group	34	38	17	89	17	11	6	34
Older age group	14	10	8	32	18	13	9	40
Total	48	48	25	121	35	24	15	74

A = Number of individuals coming first or second in a family.
B = Number of individuals third, fourth or fifth in a family.
C = Number of individuals sixth or more in a family.
T = Total number of individuals in group.

TABLE XXXVII.

b.

Numbers of men and women in terms of seniority index within the family, for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	34	42	68	144
B	28	40	63	131
C	13	20	49	82
T	75	102	180	357

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	13	35	35	83
B	13	35	24	72
C	8	17	15	40
T	34	87	74	195

A = Number of individuals coming first or second in a family.
B = Number of individuals third, fourth or fifth in a family.
C = Number of individuals sixth or more in a family.
T = Total number of individuals in group.

TABLE XXXVIII.

a.

Numbers of men and women in terms of size of family, by disability and age groups.

MEN	Disability group I				Disability group II				Disability group III			
	1-4	5-8	9+	T	1-4	5-8	9+	T	1-4	5-8	9+	T
Younger age group	16	19	7	42	17	10	5	32	5	12	7	24
Older age group	5	12	7	24	8	39	23	70	35	68	52	155
Total	21	31	14	66	25	49	28	102	40	80	59	179

WOMEN	Disability group I + II				Disability group III			
	1-3	4-7	8+	T	1-3	4-7	8+	T
Younger age group	19	50	20	89	9	16	9	34
Older age group	7	14	11	32	5	17	19	41
Total	26	64	31	121	14	33	28	75

The number of individuals in each size of family is indicated in vertical columns under the heading for number of sibs grouped as convenient in each sex.

T = Total number of individuals in group.

TABLE XXXVIII.

b.

Numbers of men and women in terms of size of family, by age groups where possible and by disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
1-4	16	17	5	38	5	8	35	48
5-8	19	10	12	41	12	39	68	119
9+	7	5	7	19	7	23	52	82
T	42	32	24	98	24	70	155	249

WOMEN	Disability groups for all ages			
	I	II	III	Total
1-3	8	18	14	40
4-7	20	44	33	97
8+	6	25	28	59
T	34	87	75	196

Number of individuals in various sizes of family are indicated in columns below the number of sibs in each, in the most suitable groups. T = Total number of individuals in group.

TABLE XXXIX.

a.

Numbers of men and women in terms of maximum daily consumption of cigarettes excluding ex-smokers, by disability and age groups.

MEN	Disability group I				Disability group II				Disability group III		
	1-3	4-6	7+	T	1-3	4-6	7+	T	1-6	7+	T
Younger age group	7	20	10	37	4	13	9	25	11	7	18
Older age group	6	14	6	26	16	27	12	54	80	22	102
Total	13	34	16	63	19	39	21	79	91	29	120

WOMEN	Disability group I + II			Disability group III		
	1-4	5+	T	1-4	5+	T
Younger age group	50	15	65	11	8	19
Older age group	3	5	8	5	10	15
Total	53	20	73	16	18	34

Coding of daily cigarette consumption:
1 = 1-4 , 2 = 5-9 , 3 = 10-14 , 4 = 15-19 , 5 = 20-24 ,
6 = 25-29 , 7 = 30-34 , 8 = 35-39 , etc.

accordingly:
coding 1-3 = under 15 daily, 4-6 = ~~20~~ 15-29 daily, 1-6 = under 30 daily,
1-4 = under 20 daily, 5+ = 20 and more, 7+ = 30 and more daily.

TABLE XXXIX.

c.

Numbers of men and women in terms of maximum daily consumption of cigarettes including ex-smokers, by disability and age groups.

MEN	Disability group I				Disability group II				Disability group III			
	1-4	5-6	7+	T	1-4	5,6	7+	T	1-4	5,6	7+	T
Younger age group	16	14	10	40	12	9	9	30	5	8	8	21
Older age group	10	12	8	30	28	21	14	63	63	48	33	144
Total	26	26	18	70	40	30	23	93	68	56	41	165

WOMEN	Disability group I + II			Disability group III		
	1-4	5+	T	1-4	5+	T
Younger age group	54	15	69	13	10	23
Older age group	3	7	10	5	11	16
Total	57	22	79	18	21	39

Coding of cigarette consumption:

1-4 = under 20 cigarettes daily, 5+ = 20 cigarettes and more,
5-6 = 20-29 cigarettes daily, 7+ = 30 cigarettes and more.
T = Total number of individuals in group.

TABLE XXXIX.

o.

Numbers of men and women in terms of present smoking habits, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	5	37	42	7	26	33	6	18	24
Older age group	7	26	33	15	55	70	54	102	156
Total	12	63	75	22	81	103	60	120	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	24	65	89	16	19	35
Older age group	23	9	32	26	15	41
Total	47	74	121	42	34	76

A = Number of individuals presently not smoking, including ex-smokers.

B = Number of individuals who smoke cigarettes at present.

T = Total number of individuals in group.

TABLE XXXIX.

g.

Numbers of men and women in terms of existence of smoking habit now or at any time, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	2	40	42	3	30	33	3	21	24
Older age group	3	30	33	7	63	70	11	145	156
Total	5	70	75	10	93	103	14	166	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	20	69	89	13	23	35
Older age group	22	10	32	25	16	41
Total	42	79	121	37	39	76

A = Number of individuals who have never smoked regularly.

B = Number of individuals who are presently smoking or have done so at any time.

T = Total number of individuals in group.

TABLE XXXIX.

1.

Numbers of men and women in terms of existence of smoking habit in regard to cigarettes excluding ex-smokers, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	2	37	39	3	26	29	3	18	21
Older age group	3	26	29	7	55	62	11	102	113
Total	5	63	68	10	81	91	14	120	134

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	20	65	85	12	19	31
Older age group	22	9	31	25	15	40
Total	42	74	116	37	34	71

A = Number of individuals never having smoked cigarettes.

B = Number of individuals presently smoking cigarettes.

T = Total number of individuals in group.

TABLE XXXIX.

b.

Numbers of men and women in terms of maximum daily cigarette consumption excluding ex-smokers, by age groups where necessary and disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
1-3	13	20	25	58
4-6	34	40	66	140
7+	16	21	29	66
T	63	81	120	264

WOMEN

	Disability groups for younger age group			Disability groups for older age group		
	I + II	III	Total	I + II	III	Total
1-4	50	11	61	3	5	8
5+	15	8	23	5	10	15
T	65	19	84	8	15	23

Coding of daily cigarette consumption:
Code 1 = under 5, 2 = under 10, 3 = under 15, 4 = under 20 etc.

1-3 = under 15 cigarettes daily, 1-4 = under 20 cigarettes, 5+ = 20 and more.

1-6 = under 30 cigarettes daily, 4-6 = ~~20~~ 15-29 cigarettes, 7+ = 30 and more.

TABLE XXXIX.

d.

Numbers of men and women in terms of maximumdaily cigarette consumption including ex-smokers, by age groups where necessary and disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
0	5	10	14	29
1-4	26	40	69	135
5,6	26	30	56	112
7+	18	23	41	82
T	75	103	180	358

WOMEN — Disability groups for younger age group

	I	II	III	Total
0	8	12	12	32
1-3	9	30	10	49
4+	11	19	13	43
T	28	61	35	124

Disability groups for older age group

Insufficient numbers to analyse in this grouping.

Coding of daily cigarette consumption:

0 = Number of individuals who have never smoked,
1-3 = Number of individuals smoking under 15 cigarettes daily,
1-4 = Number of individuals smoking under 20 cigarettes daily,
4+ = Number of individuals smoking ~~20~~ 15 or more cigarettes daily,
5,6 = Number of individuals smoking 20-29 cigarettes daily,
7+ = Number of individuals smoking 30 or more cigarettes daily,
T = Total number of individuals in group.

TABLE XXXIX.

f.

Numbers of men and women in terms of present smoking of cigarettes, by disability groups and where necessary by age groups.

MEN — Disability groups for all ages

	I	II	III	Total
A	12	22	60	94
B	63	81	120	264
T	75	103	180	358

WOMEN

	Disability groups for younger age group				Disability groups for older age group		
	I	II	III	Total	I + II	III	Total
A	8	16	16	40	23	26	49
B	20	45	19	84	9	15	24
T	28	61	35	124	32	41	73

A = Number of individuals not smoking presently, including ex-smokers.

B = Number of individuals who smoke cigarettes at present.

T = Total number of individuals in group.

TABLE XXXIX.

h.

Numbers of men and women in terms of the existence of the cigarette smoking habit at any time, by disability groups for the whole age range.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	5	10	14	29
B	70	93	166	329
T	75	103	180	358

WOMEN

	Disability groups for younger age group				Disability groups for older age group		
	I	II	III	Total	I + II	III	Total
A	8	12	13	33	22	25	47
B	20	49	23	92	10	16	26
T	28	61	35	124	32	41	73

A = Number of individuals never having smoked cigarettes.

B = Number of individuals presently and previously smoking cigarettes.

T = Total number of individuals in group.

TABLE XXXIX.

J.

Numbers of men and women in terms of existence of the cigarette smoking habit, by age and disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
A	5	10	14	29
B	63	81	120	264
T	68	91	134	293

WOMEN

	Disability groups for younger age group				Disability groups for older age group		
	I	II	III	Total	I + II	III	Total
A	8	12	12	32	22	25	47
B	20	45	19	84	8	15	23
T	28	57	31	116	30	40	70

A = Number of individuals never having smoked cigarettes.

B = Number of individuals at present smoking cigarettes.

T = Total number of individuals in group.

TABLE XXXIX.

k.

Numbers of men and women in terms of maximum daily cigarette consumption, including ex-smokers, by age where necessary and disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
1-4	26	40	69	135
5,6	26	30	56	112
7+	18	23	41	82
T	75	103	180	358

WOMEN

	Disability groups for younger age group			Disability groups for older age group		
	I + II	III	Total	I + II	III	Total
1-4	54	13	67	3	5	8
5+	15	10	25	7	11	18
T	69	23	92	10	16	26

or

	I	II	III	Total	I + II	III	Total
1-3	9	30	10	49	3	2	5
4+	11	19	13	43	7	16	23
T	20	49	23	92	10	18	28

Coding of daily cigarette consumption:

1-3 = Numbers smoking under 15 daily, 1-4 = under 20 daily, 4+ = ~~20~~ 15 and more
5+ = 20 cigarettes and more, 5,6 = 20-29 daily, 7+ = 30 or more daily.
T = Total number of individuals in group.

TABLE XXXIX.

1.

Numbers of men in terms of maximum daily cigarette consumption excluding ex-smokers, by disability groups for the whole age range.

MEN	Disability groups for all ages			
	I	II	III	Total
0	5	10	14	29
1-3	13	20	25	58
4-6	34	40	66	140
7+	16	21	29	66
T	68	91	134	293

Coding of cigarette consumption:

0 = Number of individuals who have never smoked.
1-3 = Number of individuals presently smoking, maximum under 15 daily.
4-6 = Number at present smoking maximum of 15-29 cigarettes daily.
7+ = Number at present smoking maximum of 30 or more daily.
T = Total number of individuals in group.

TABLE XL.

a.

Numbers of men and women in terms of age at start of smoking habit, by disability and age groups.

MEN	Disability group I			Disability group II				Disability group III		
	A	B	T	A	C	D	T	A	B	T
Younger age group	20	20	40	9	13	8	30	7	14	21
Older age group	9	21	30	34	23	7	64	69	76	145
Total	29	41	70	43	36	15	94	76	90	166

WOMEN	Disability group I + II			Disability group III		
	A	B	T	E	D	T
Younger age group	23	48	71	13	6	19
Older age group	3	8	11	6	11	17
Total	26	56	82	19	17	36

A = Number of individuals starting under the age of 16 years.
B = Number of individuals starting after the age of sixteen.
E = Number of individuals starting under the age of 21 years.
C = Number of individuals starting above 16 and under 21 years.
D = Number of individuals starting at 21 years or more.
T = Total number of individuals in group.

TABLE XL.

b.

Numbers of men and women in terms of age at start of smoking habit, by age groups where applicable and by disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	20	9	7	36	9	34	69	112
B	20	21	14	55	21	30	76	127
T	40	30	21	91	30	64	145	239

WOMEN	Disability groups for all ages			
	I	II	III	Total
A	9	17	17	43
B	15	41	18	74
T	24	58	35	117

A = Number of individuals starting smoking before the age of 16 years.

B = Number of individuals starting later than this.

T = Total number of individuals in group.

TABLE XLI.

a.

Numbers of men and women in terms of duration of the smoking habit, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	C	D	T
Younger age group	35	5	40	22	8	30	13	8	21
Older age group	5	25	30	4	61	65	5	141	146
Total	40	30	70	26	69	75	18	149	167

WOMEN	Disability group I + II			Disability group III		
	C	D	T	C	D	T
Younger age group	59	10	69	15	8	23
Older age group	2	8	10	7	9	16
Total	61	18	79	22	17	39

A = Number of individuals who have smoked less than 30 years.
B = Number of individuals who have smoked 30 years and more.
T = Total number of individuals in group.
C = Number of individuals who have smoked less than 25 years.
D = Number of individuals who have smoked 25 years and more.

TABLE XLI.

b.

Numbers of men and women in terms of duration of smoking habit, by age and disability groups.

MEN	Disability groups for younger age group					Disability groups for older age group			
	I	II	III	Total		I	II	III	Total
A	22	8	8	38	D	17	9	21	47
B	5	11	5	21	E	5	16	43	64
C	13	11	8	32	F	8	40	82	130
T	40	30	21	91	T	30	65	146	241

WOMEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
G	10	21	9	40	10	19	7	36
H	13	35	30	78	10	30	16	56
T	23	56	39	118	20	49	23	92

A = Number of individuals with smoking history up to 19 years.
B = Number of individuals with history of 20-24 years.
C = Number of individuals with history over 25 years.
T = Total number of individuals in group.
D = Number of individuals with history up to 34 years.
E = Number of individuals with history of 35-39 years.
F = Number of individuals with history at least 40 years.
G = Number of individuals with history of under 15 years.
H = Number of individuals with history of at least 15 years.

TABLE XLII.

a.

Numbers of men and women in terms of regular consumption of alcohol, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	21	21	42	15	18	33	16	8	24
Older age group	17	16	33	41	29	70	87	69	156
Total	38	37	75	56	47	103	103	77	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	14	75	89	5	30	35
Older age group	4	28	32	2	39	41
Total	18	103	121	7	69	76

A = Number of individuals admitting to regular drinking.

B = Number of individuals not so admitting.

T = Total number of individuals in group.

TABLE XLII.

b.

Numbers of men and women in terms of regular alcohol consumption, by disability groups for the whole age range.

MEN — Disability groups for all ages

	I	II	III	Total
A	38	56	103	197
B	37	47	77	161
T	75	103	180	358

WOMEN — Disability groups for all ages

	I + II	III	Total
A	18	7	25
B	103	69	172
T	121	76	197

A = Number of individuals admitting regular drinking.

B = Number of individuals not so admitting.

T = Total number of individuals in group.

TABLE XLIII.

a.

Numbers of men and women in terms of "degrees of addiction" to alcohol, by disability and age groups.

MEN	Disability group I					Disability group II			
	O	L	M	H	T	O L	M	H	T
Younger age group	5	15	15	7	42	15	12	6	33
Older age group	5	13	10	5	33	28	32	10	70
Total	10	28	25	12	75	43	44	16	103

	Disability group III			
	O L	M	H	T
Younger age group	8	9	7	24
Older age group	71	55	30	156
Total	79	64	37	180

WOMEN	Disability group I + II				Disability group III			
	O	L	M H	T	O	L	M H	T
Younger age group	32	41	16	89	15	14	6	35
Older age group	15	13	4	32	22	14	5	41
Total	47	54	20	121	37	28	11	76

O = Number of individuals who claim to be abstainers.
L = Number of individuals who are light drinkers.
M = Number of individuals who claim to be moderate drinkers.
H = Number of individuals who admit to heavy drinking.
T = Total number of individuals in group.

TABLE XLIII.

b.

Numbers of men and women in terms of degrees of alcohol consumption, by disability groups for the whole age range.

MEN

	Disability groups for all ages			
	I	II	III	Total
O+L	38	43	79	160
M	25	44	64	133
H	12	16	37	65
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
O	8	39	37	84
L	21	33	28	82
M+H	5	15	11	31
T	34	87	76	197

O = Number of individuals claiming to be abstainers.
L = Number of individuals claiming to be light drinkers.
M = Number of individuals claiming to be moderate drinkers.
H = Number of individuals claiming to be heavy drinkers.
T = Total number of individuals in group.

TABLE XLIV.

a.

Numbers of men and women in terms of preference for ale or stout, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	34	8	42	28	5	33	19	5	24
Older age group	16	17	33	46	24	70	104	52	156
Total	50	25	75	74	29	103	123	57	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	10	79	89	2	33	35
Older age group	2	30	32	2	39	41
Total	12	109	121	4	72	76

A = Number of individuals who drink predominantly beer, ale or stout.

B = Number of individuals who do not meet this description.

T = Total number of individuals in group.

TABLE XLIV.

b.

Numbers of men abd women in terms of preference for ale and stout, by age groups where necessary and by disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	34	28	19	81	16	46	104	166
B	8	5	5	18	17	24	52	93
T	42	33	24	99	33	70	156	259

WOMEN	Disability groups for all ages		
	I	II+III	Total
A	5	11	16
B	29	152	181
T	34	163	197

A = Number of individuals who drink beer, ale or stout by preference.

B = Number of individuals who do not do so.

T = Total number of individuals in group.

TABLE XLV.

a.

Numbers of men and women in terms of spirit drinking, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	15	27	42	10	23	33	11	13	24
Older age group	16	17	33	28	42	70	60	96	156
Total	31	44	75	38	65	103	71	109	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	41	48	89	20	15	35
Older age group	14	18	32	15	26	41
Total	55	66	121	35	41	76

A = Number of individuals who drink spirits by preference.

B = Number of individuals who do not drink spirits by preference.

T = Total number of individuals in group.

TABLE XLV.

b.

Numbers of men and women in terms of spirit drinking, for the whole age range by disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
A	31	38	71	140
B	44	65	109	218
T	75	103	180	358

WOMEN — Disability groups for all ages

	I	II	III	Total
A	15	40	35	90
B	19	47	41	107
T	34	87	76	197

A = Number of individuals drinking spirits by preference.

B = Number of individuals not doing so.

T = Toyal number of individuals in group.

TABLE XLVI.

a.

Numbers of men and women in terms of duration of chest history, by disability and age groups.

MEN

	Disability group I				Disability group II				
	0	1,2	3+	T	0	1,2	3,4	5+	T
Younger age group	19	18	5	42	12	6	8	7	33
Older age group	9	13	11	33	15	30	13	12	70
Total	28	31	16	75	27	36	21	19	103

	Disability group III			
	0,1	2,3	4+	T
Younger age group	6	11	7	24
Older age group	63	52	41	156
Total	69	63	48	180

WOMEN

	Disability group I + II				Disability group III			
	0	1,2	3+	T	0	1,2	3+	T
Younger age group	28	48	13	89	5	14	16	35
Older age group	12	12	8	32	9	13	19	41
Total	40	60	21	121	14	27	35	76

Coding of chest history duration:

0 = Number of individuals with history of 0-4 years.
1 = Number of individuals with history of 5-9 years.
2 = Number with 10-14 years. 3 = Number with 15-19 years.
4 = Number with 20-24 years. 5 = Number with 25-29 years.

TABLE XLVI.

b.

Numbers of men and women in terms of duration of chest history, by disability groups for the whole age range.

MEN — Disability groups for all ages

	I	II	III	Total
0	28	27	27	82
1	22	26	44	92
2	9	10	32	51
3,4	6	21	47	74
5+	10	19	30	59
T	75	103	180	358

WOMEN — Disability groups for all ages

	I	II	III	Total
0	12	28	14	54
1,2	15	45	27	87
3+	7	14	35	56
T	34	87	76	197

Coding of chest history duration:
0 = Number of individuals with history of 0-4 years.
1 = Number of individuals with history of 5-9 years.
2 = Number of individuals with history of 10-14 years.
3 = Number of individuals with history of 15-19 years.
4 = Number of individuals with history of 20-24 years.
5 = Number of individuals with history of 25-29 years.
T = Total number of individuals in group.

TABLE XLVII.

a.

Numbers of men and women in terms of chest history in the previous generation, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	32	10	42	22	11	33	12	12	24
Older age group	12	21	33	29	41	70	74	82	156
Total	44	31	75	51	52	103	86	94	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	58	31	89	26	9	35
Older age group	12	20	32	24	17	41
Total	70	51	121	50	26	76

A = Number of individuals reporting chest history in previous generation.

B = Number of individuals not admitting this.

T = Total number of individuals in group.

TABLE XLVII.

b.

Numbers of men and women in terms of chest history in the previous generation, by age and disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	32	22	12	66	12	29	74	115
B	10	11	12	33	21	41	82	144
T	42	33	24	99	33	70	156	259

WOMEN	Disability groups for younger age group			Disability groups for older age group		
	I + II	III	Total	I + II	III	Total
A	58	26	84	12	24	36
B	31	9	40	20	17	37
T	89	35	124	32	41	73

A = Number of individuals reporting chest history in previous generation.

B = Number of individuals not admitting this.

T = Total number of individuals in group.

TABLE XLVIII.

a.

Numbers of men and women in terms of ghost history in sibs, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	17	25	42	13	20	33	9	15	24
Older age group	13	20	33	21	49	70	64	92	156
Total	30	45	75	34	69	103	73	107	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	38	51	89	10	25	35
Older age group	12	20	32	20	21	41
Total	50	71	121	30	46	76

A = Number of individuals claiming ghost histories in a sib.

B = Number of individuals without any such history.

T = Total number of individuals in group.

TABLE XLVIII.

b.

Numbers of men and women in terms of chest history in a sib, by age groups where appropriate and by disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	17	13	9	39	13	21	64	98
B	25	20	15	60	20	49	92	161
T	42	33	24	99	33	70	156	259

WOMEN	Disability groups for all ages			
	I	II	III	total
A	15	35	30	80
B	19	52	46	117
T	34	87	76	197

A = Number of individuals with chest history in a sib.

B = Number of individuals with no such history.

T = Total number of individuals in group.

TABLE XLIX.

a.

Numbers of men and women in terms of chest history in infancy, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	5	37	42	9	24	33	8	16	24
Older age group	2	31	33	6	64	70	16	140	156
Total	7	68	75	15	88	103	24	156	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	18	71	89	11	24	35
Older age group	6	26	32	9	32	41
Total	24	97	121	20	56	76

A = Number of individuals admitting personal chest history in infancy.

B = Number of individuals not reporting any such history.

T = Total number of individuals in group.

TABLE XLIX.

b.

Numbers of men and women in terms of chest history in infancy, by age groups where applicable and by disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group		
	I	II	III	Total	I + II	III	Total
A	5	9	8	22	8	16	24
B	37	24	16	77	95	140	235
T	42	33	24	99	103	156	259

WOMEN	Disability groups for all ages			
	I	II	III	Total
A	5	19	20	44
B	29	68	56	153
T	34	87	76	197

A = Number of individuals admitting chest history in infancy.

B = Number of individuals not admitting any such personal history.

T = Total number of individuals in group.

TABLE 1.

a.

Numbers of men and women in terms of chest history in childhood, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	15	27	42	10	23	33	15	9	24
Older age group	8	25	33	9	61	70	30	126	156
Total	23	52	75	19	84	103	45	135	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger afe group	26	63	89	16	19	35
Older age group	7	25	32	11	30	41
Total	33	88	121	27	49	76

A = Number of individuals admitting chest history in childhood.

B = Number of individuals not admitting any such personal history.

T = Total number of individuald in group.

TABLE I.

b.

Numbers of men and women in terms of personal childhood chest history, by age groups where applicable and by disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	15	10	15	40	8	9	30	47
B	27	23	9	59	25	61	126	212
T	42	33	24	99	33	70	156	259

WOMEN	Disability groups for all ages			
	I	II	III	Total
A	6	27	27	60
B	28	60	49	137
T	34	87	76	197

A = Number of individuals admitting chest history in childhood.

B = Number of individuals not so admitting.

T = Total number of individuals in group.

TABLE LI.

a.

Numbers of men and women in terms of state of nutrition, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	F + M	S	T	F + M	S	T	F + M	S	T
Younger age group	20	22	42	20	13	33	10	14	24
Older age group	21	12	33	41	29	70	67	89	156
Total	41	34	75	61	42	103	77	103	180

WOMEN	Disability group I + II				Disability group III			
	F	M	S	T	F	M	S	T
Younger age group	5	33	51	89	8	15	12	35
Older age group	17	9	6	32	19	9	13	41
Total	22	42	57	121	27	24	25	76

F = Number of individuals judged distinctly overweight or obese.

M = Number of individuals judged "normal" or medium nourished.

S = Number of individuals judged slim or sparely built.

T = Total number of individuals in group.

TABLE LI.

b.

Numbers of men and women in terms of state of nourishment, by age groups where applicable and by disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
F	7	26	22	55
M	34	35	55	124
S	34	42	103	179
T	75	103	180	358

WOMEN

	Disability groups for younger age group			Disability groups for older age group		
	I + II	III	Total	I + II	III	Total
F	5	8	13	17	19	36
M	33	15	48	9	9	18
S	51	12	63	6	13	19
T	89	35	124	32	41	73

F = Number of individuals judged distinctly overweight or obese.

M = Number of individuals judged "normal" or medium nourished.

S = Number of individuals judged slim or sparely built.

T = Total number of individuals in group.

TABLE LII.

a.

Numbers of men and women in terms of haemoglobin level, by disability and age groups.

MEN	Disability group I				Disability group II			
	L	M	H	T	L	M	H	T
Younger age group	7	16	19	42	9	19	5	33
Older age group	5	20	8	33	12	33	25	70
Total	12	36	27	75	21	52	30	103

	Disability group III			
	L	M	H	T
Younger age group	10	6	8	24
Older age group	41	78	37	156
Total	51	84	45	180

WOMEN	Disability group I + II				Disability group III		
	L	M	H	T	L	M + H	T
Younger age group	38	36	15	89	15	20	35
Older age group	8	18	6	32	12	29	41
Total	46	54	21	121	27	49	76

L = Number of individuals with haemoglobin estimated under 100% Sahli.
M = Number of individuals with haemoglobin of 100-110% Sahli.
H = Number of individuals with haemoglobin above 110% Sahli.
T = Total number of individuals in group.

TABLE LII.

b.

Numbers of men and women in terms of estimated haemoglobin levels, for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
L	12	21	51	84
M	36	52	84	172
H	27	30	45	102
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
L	14	32	27	73
M	14	40	37	91
H	6	15	12	33
T	34	87	76	197

L = Number of individuals with estimated haemoglobin under 100% Sahli.
M = Number of individuals with haemoglobin 100-110% Sahli.
H = Number of individuals with haemiglobin above 110% Sahli.
T = Total number of individuals in group.

TABLE LIII.

a.

Numbers of men and women in terms of sputum purulence, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	13	29	42	12	21	33	13	11	24
Older age group	8	25	33	21	49	70	80	76	156
Total	21	54	75	33	70	103	93	87	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	25	64	89	17	18	35
Older age group	9	23	32	8	33	41
Total	34	87	121	25	51	76

A = Number of individuals returning purulent specimens or reporting yellow colour.

B = Number of individuals with specimens free of purulence and not reporting yellow colour.

T = Total number of individuals in group.

TABLE LIII.

b.

Numbers of men and women in terms of sputum purulence, by age groups where applicable and by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	21	33	93	147
B	54	70	87	211
T	75	103	180	358

WOMEN

	Disability groups for younger age group				Disability groups for older age group		
	I	II	III	Total	I + II	III	Total
A	9	16	17	42	9	8	17
B	19	45	18	82	23	33	56
T	28	61	35	124	32	41	73

A = Number of individuals returning purulent specimen or reporting yellow sputum.

B = Number of individuals not so doing.

T = Total number of individuals in group.

TABLE LIV.

a.

Numbers of men and women in terms of quantity of sputum, excluding purulent cases, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	11	18	29	4	17	21	1	10	11
Older age group	9	16	25	6	43	49	10	66	76
Total	20	34	54	10	60	70	11	76	87

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	24	40	64	9	9	18
Older age group	12	13	25	19	14	33
Total	36	53	89	28	23	51

A = Number of individuals returning specimens 2 ml. or less, non-purulent.

B = Number of individuals returning specimens over 2 ml., non-purulent.

T = Total number of individuals in group.

TABLE LIV.

b.

Numbers of men and women in terms of volume of sputum, excluding purulent cases, by disability groups for the whole age range.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	20	10	11	41
B	34	60	76	170
T	54	70	87	211

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	9	27	28	64
B	14	39	23	76
T	23	66	51	140

A = Number of individuals returning specimens of 2 ml. or less.

B = Number of individuals returning specimens of over 2 ml.

T = Total number of individuals in group.

TABLE LIV.

c.

Numbers of men and women in terms of excessive sputum volume, including purulent cases, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B C	T	A	B C	T	A	B C	T
Younger age group	12	31	43	7	26	33	3	22	25
Older age group	10	26	36	7	66	73	10	147	157
Total	22	57	79	14	92	106	13	169	182

WOMEN	Disability group. I + II				Disability group III		
	A	B	C	T	A	B C	T
Younger age group	33	58	6	97	11	23	34
Older age group	13	8	6	27	14	26	40
Total	46	66	12	124	25	49	74

A = Number of individuals with 1 hour morning specimen under 2 ml. volume.

B = Number of individuals with 1 hour morning specimen 2-6 ml. volume.

C = Number of individuals with specimen over 6 ml. volume.

T = Total number of individuals in group.

TABLE LIV.

d.

Numbers of men and women in terms of excessive volume of sputum including purulent cases, by age groups where necessary and by disability groups.

MEN — Disability groups for all ages

	I	II	III	total
A	22	14	13	49
B	52	80	150	282
C	5	12	19	36
T	79	106	182	367

WOMEN

Disability groups for younger age group

	I + II	III	Total
A	33	11	44
B	58	16	74
C	6	7	13
T	97	34	131

Disability groups for older age group

	I + II	III	Total
A	13	14	27
BC	14	26	40
T	27	40	67

A = Number of individuals whose 1st. hr. morning specimen volume is under 2 ml.

B = Number of individuals whose specimen volume is 2-6 ml.

C = Number of individuals whose specimen volume is over 6 ml.

T = Total number of individuals in group.

TABLE IV.

a.

Numbers of men and women in terms of shoemaker's chest deformity, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	7	35	42	7	26	33	8	16	24
Older age group	11	22	33	18	52	70	42	114	156
Total	18	57	75	25	78	103	50	130	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	23	66	89	4	31	35
Older age group	4	28	32	7	34	41
Total	27	94	121	11	65	76

A = Number of individuals exhibiting shoemaker type depression of sternum.

B = Number of individuals showing no such deformity.

T = Total number of individuals in group.

TABLE IV.

b.

Numbers of men and women in terms of shoemaker's chest deformity, for the whole age range by disability groups.

MEN

Disability groups for all ages

	I	II	III	Total
A	18	25	50	93
B	57	78	130	265
T	75	103	180	358

WOMEN

Disability groups for all ages

	I	II	III	Total
A	7	20	11	38
B	27	67	65	159
T	34	87	76	197

A = Number of individuals exhibiting shoemaker type depression of sternum.

B= Number of individuals not showing such deformity.

T = Total number of individuals in group.

TABLE LVI.

a.

Numbers of men and women in terms of presence or absence of Harrison's sulcus, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	13	29	42	12	21	33	13	11	24
Older age group	17	16	33	21	49	70	69	87	156
Total	30	45	75	33	70	103	82	98	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	33	56	89	4	31	35
Older age group	5	27	32	7	34	41
Total	38	83	121	11	65	76

A = Number of individuals exhibiting Harrison's sulcus.

B = Number of individuals not showing this deformity.

T = Total number of individuals in group.

TABLE LVI.

b.

Numbers of men and women in terms of Harrison's sulcus occurrence, by age groups where applicable and by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	30	33	82	145
B	45	70	98	213
T	75	103	180	358

WOMEN

	Disability groups for younger age group			Disability groups for older age group		
	I + II	III	Total	I + II	III	Total
A	33	4	37	5	7	12
B	56	31	87	27	34	61
T	89	35	124	32	41	73

A = Number of individuals exhibiting Harrison's sulcus.

B = Number of individuals not doing so.

T = Total number of individuals in group.

TABLE LVII.

a.

Numbers of men and women in terms of the appearance of obvious kyphosis, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	13	29	42	15	18	33	13	11	24
Older age group	13	20	33	31	39	70	99	57	156
Total	26	49	75	46	57	103	112	68	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	27	62	89	14	21	35
Older age group	19	13	32	24	17	41
Total	46	75	121	38	38	76

A = Number of individuals showing kyphosis on inspection.

B = Number of individuals not judged to have appreciable kyphosis.

T = Total number of individuals in group.

TABLE LVII.

b.

Numbers of men and women in terms of visible kyphosis, by age groups where applicable and by disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
A	26	46	112	184
B	49	57	68	174
T	75	103	180	358

WOMEN

	Disability groups for younger age group			Disability groups for older age group		
	I + II	III	Total	I + II	III	Total
A	27	62	89	19	13	32
B	14	21	35	24	17	41
T	41	83	124	43	30	73

A = Number of individuals showing kyphosis on inspection.

B = Number of individuals not so showing kyphosis.

T = Total number of individuals in group.

TABLE LVIII.

a.

Numbers of men and women in terms of visible intercostal retraction, by disability groups and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	16	26	42	7	26	33	16	8	24
Older age group	10	23	33	22	48	70	92	64	156
Total	26	49	75	29	74	103	108	72	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	19	70	89	7	28	35
Older age group	4	28	32	8	33	41
Total	23	98	121	15	61	76

A = Number of individuals with intercostal retraction on inspection.

B = Number of individuals demonstrating no such sign.

T = Total number of individuals in group.

TABLE LVIII.

b.

Numbers of men and women in terms of visible intercostal retraction, by disability groups for the whole age gange.

MEN

Disability groups for all ages

	I	II	III	Total
A	26	29	108	163
B	49	74	72	195
T	75	103	180	358

WOMEN

Disability groups for all ages

	I	II	III	Total
A	8	15	15	38
B	26	72	61	159
T	34	87	76	197

A = Number of individuals showing intercostal retraction on inspection.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LIX.

a.

Numbers of men and women in terms of barrelling of the chest, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	9	33	42	10	23	33	11	13	24
Older age group	15	18	33	26	44	70	81	75	156
Total	24	51	75	36	67	103	92	88	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	12	77	89	15	20	35
Older age group	13	19	32	20	21	41
Total	25	96	121	35	41	76

A = Number of individuals exhibiting barrelling of chest.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LIX.

b.

Numbers of men and women in terms of barrelling of the chest, by age and disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	9	10	11	30	15	26	81	122
B	33	23	13	69	18	44	75	137
T	42	33	24	99	33	70	156	259

WOMEN	Disability groups for younger age group			Disability groups for older age group		
	I + II	III	Total	I + II	III	Total
A	12	77	89	15	20	35
B	13	19	32	20	21	41
T	25	96	121	35	41	76

A = Number of individuals showing barrelling of the chest.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE IX.

a.

Numbers of men and women in terms of "short neck" on inspection, by disability groups and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	6	36	42	11	22	33	11	13	24
Older age group	11	22	33	32	38	70	81	75	156
Total	17	58	75	43	60	103	92	88	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	17	72	89	15	20	35
Older age group	12	20	32	19	22	41
Total	29	92	121	34	42	76

A = Number of individuals showing distinctly shorter neck than average.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE IX.

b.

Numbers of men and women in terms of visibly "short neck", by age groups where applicable and by disability groups.

MEN

	Disability groups for allages			
	I	II	III	Total
A	17	43	92	152
B	58	60	88	206
T	75	103	180	358

WOMEN

	Disability groups for younger age group			Disability groups for older age group		
	I + II	III	Total	I + II	III	Total
A	17	72	89	12	20	32
B	15	20	35	19	22	41
T	32	92	124	31	42	73

A = Number of individuals showing distinctly shorter neck than average.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXI.

a.

Numbers of men and women in terms of prominence of sternomastoid, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	10	32	42	16	17	33	19	5	24
Older age group	20	13	33	40	30	70	136	20	156
Total	30	45	75	56	47	103	155	25	180

WOMEN	Disability group I + II			Disability group III		
	A	D	T	A	B	T
Younger age group	34	55	89	16	19	35
Older age group	14	18	32	27	14	41
Total	48	73	121	43	33	76

A = Number of individuals showing constant prominence of sternomastoid.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXI.

b.

Numbers of men and women in terms of prominence of sternomastoid, by age groups where applicable and by disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	10	16	19	45	20	40	136	196
B	32	17	5	54	13	30	20	63
T	42	33	24	99	33	70	156	259

WOMEN	Disability groups for all ages			
	I	II	III	Total
A	16	32	43	91
B	18	55	33	106
T	34	87	76	197

A = Number of individuals showing persistent prominence of sternomastoid.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXII.

a.

Numbers of men and women in terms of supraclavicular bulging, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	14	28	42	7	26	33	4	20	24
Older age group	17	16	33	28	42	70	59	97	156
Total	31	44	75	35	68	103	63	117	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	15	74	89	13	22	35
Older age group	18	14	32	15	26	41
Total	33	88	121	28	48	76

A = Number of individuals showing distinct supraclavicular bulging.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXII.

b.

Numbers of men and women in terms of supraclavicular bulging, by age groups where applicable and by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	31	35	63	129
B	44	68	117	229
T	75	103	180	358

WOMEN

	Disability groups for younger age group			Disability groups for older age group		
	I + II	III	Total	I + II	III	Total
A	15	13	28	18	15	33
B	74	22	96	14	26	40
T	89	35	124	32	41	73

A = Number of individuals showing distinct supraclavicular bulging.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXIII.

a.

Numbers of men and women in terms of inspiratory posture, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	7	35	42	9	24	33	16	8	24
Older age group	13	20	33	44	26	70	107	49	156
Total	20	55	75	53	50	103	123	57	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	23	66	89	19	16	35
Older age group	20	12	32	31	10	41
Total	43	78	121	50	26	76

A = Number of individuals showing little variation from a position of full inspiration.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXIII.

b.

Numbers of men and women in terms of inspiratory posture, by age and disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	7	9	16	32	13	44	107	164
B	35	24	8	67	20	26	49	95
T	42	33	24	99	33	70	156	259

WOMEN	Disability groups for younger age group			Disability groups for older age group		
	I + II	III	Total	I + II	III	Total
A	15	13	28	18	15	33
B	74	22	96	14	26	40
T	89	35	124	32	41	73

A = Number of individuals maintaining full inspiratory posture.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXIV.

a.

Numbers of men and women in terms of full jugular veins, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	13	29	42	5	28	33	8	16	24
Older age group	19	14	33	34	36	70	79	77	156
Total	32	43	75	39	64	103	87	93	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	18	71	89	8	27	35
Older age group	9	23	32	14	27	41
Total	27	94	121	22	54	76

A = Number of individuals showing full jugular veins.

B = Number of individuals not showing full veins.

T = Total number of individuals in group.

TABLE LXIV.

b.

Numbers of men and women in terms of full jugular veins, by age groups where applicable and by disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	13	5	8	26	19	34	79	132
B	29	28	16	73	14	36	77	127
T	42	33	24	99	33	70	156	259

WOMEN	Disability groups for all ages			
	I	II	III	Total
A	7	20	22	49
B	27	67	54	148
T	34	87	76	197

A = Number of individuals showing full jugular veins.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXV.

a.

Numbers of men and women in terms of "emphysematous girdle", by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	23	19	42	24	9	33	13	11	24
Older age group	28	5	33	47	23	70	112	44	156
Total	51	24	75	71	32	103	125	55	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	18	71	89	4	31	35
Older age group	10	22	32	18	23	41
Total	28	93	121	22	54	76

A = Number of individuals demonstrating emphysematous girdle.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXV.

b.

Numbers of men and women in terms of "emphysematous girdle", by age and disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	23	24	13	60	28	47	112	187
B	19	9	11	39	5	23	44	72
T	42	33	24	99	33	70	156	259

WOMEN	Disability groups for younger age group			Disability groups for older age group		
	I + II	III	Total	I + II	III	Total
A	18	4	22	10	18	28
B	71	31	102	22	23	45
T	89	35	124	32	41	73

A = Number of individuals showing emphysematous girdle.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXVI.

a.

Numbers of men and women in terms of hyperresonance, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	33	9	42	26	7	33	22	2	24
Older age group	29	4	33	61	9	70	142	14	156
Total	62	13	75	87	16	103	164	16	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	71	18	89	30	5	35
Older age group	22	10	32	34	7	41
Total	93	28	121	64	12	76

A = Number of individuals with hyperresonance to percussion generally.

B = Number of individuals not showing general hyperresonance.

T = Total number of individuals in group.

TABLE LXVI.

b.

Numbers of men and women in terms of hyperresonance, by disability groups for the whole age range.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	62	87	164	313
B	13	16	16	45
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	27	66	64	157
B	7	21	12	40
T	34	87	76	197

A = Number of individuals exhibiting hyperresonance to percussion.

B = Number of individuals not doing so.

T = Total number of individuals in group.

TABLE LXVII.

a.

Numbers of men and women in terms of resonance of abnormal extent, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	22	20	42	18	15	33	16	8	24
Older age group	22	11	33	48	22	70	118	38	156
Total	44	31	75	66	37	103	134	46	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	54	35	89	24	11	35
Older age group	14	18	32	28	13	41
Total	68	53	121	52	24	76

A = Number of individuals exhibiting resonance extending to costal margin.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXVII.

b.

Numbers of men and women in terms of resonance extending to costal margin, for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	44	66	134	244
B	31	37	46	114
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	18	50	52	120
B	16	37	24	77
T	34	87	76	197

A = Number of individuals exhibiting resonance extending to costal margin.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXVIII.

a.

Numbers of men and women in terms of weak respiratory murmur, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	13	29	42	13	20	33	13	11	24
Older age group	16	17	33	36	34	70	91	65	156
Total	29	46	75	49	54	103	104	76	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	35	54	89	15	20	35
Older age group	9	23	32	18	23	41
Total	44	77	121	33	43	76

A = Number of individuals exhibiting weak or absent respiratory murmur.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXVIII.

b.

Numbers of men and women in terms of weak respiratory murmur, for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	29	49	104	182
B	46	54	76	176
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	15	29	33	77
B	19	58	43	120
T	34	87	76	197

A = Number of individuals exhibiting weakness of respiratory murmur.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXIX.

a.

Numbers of men and women in terms of diminished vocal fremitus, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	11	31	42	12	21	33	11	13	24
Older age group	6	27	33	15	55	70	63	93	156
Total	17	58	75	27	76	103	74	106	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	57	32	89	21	14	35
Older age group	13	19	32	17	24	41
Total	70	51	121	38	38	76

A = Number of individuals exhibiting diminished vocal fremitus.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXIX.

b.

Numbers of men and women in terms of diminished vocal fremitus, by age groups where applicable and by disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
A	17	27	74	118
B	58	76	106	240
T	75	103	180	358

WOMEN

	Disability groups for younger age group				Disability groups for older age group		
	I	II	III	Total	I + II	III	Total
A	19	38	21	78	13	17	30
B	9	23	14	46	19	24	43
T	28	61	35	124	32	41	73

A = Number of individuals exhibiting diminution of normal vocal fremitus.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXX.

a.

Numbers of men and women in terms of diminished vocal resonance, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	7	35	42	11	22	33	11	13	24
Older age group	8	25	33	18	52	70	60	96	156
Total	15	60	75	29	74	103	71	109	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	43	46	89	22	13	35
Older age group	13	19	32	24	17	41
Total	56	65	121	46	30	76

A = Number of individuals exhibiting diminution of vocal resonance.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXX.

b.

Numbers of men and women in terms of diminution of vocal resonance, for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	15	29	71	115
B	60	74	109	243
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	16	40	46	102
B	18	47	30	95
T	34	87	76	197

A = Number of individuals showing general diminution of vocal resonance.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXXI.

a.

Numbers of men and women in terms of prolonged expiration, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	18	24	42	15	18	33	14	10	24
Older age group	17	16	33	39	31	70	110	46	156
Total	35	40	75	54	49	103	124	56	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	37	52	89	22	13	35
Older age group	18	14	32	28	13	41
Total	55	66	121	50	26	76

A = Number of individuals exhibiting prolonged expiration on auscultation.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXXI.

b.

Numbers of men and women in terms of prolonged expiration, for the whole age range by disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
A	35	54	124	213
B	40	49	56	145
T	75	103	180	358

WOMEN — Disability groups for all ages

	I	II	III	Total
A	10	45	50	105
B	24	42	26	92
T	34	87	76	197

A = Number of individuals with prolonged expiration generally.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXXII.

a.

Numbers of men and women in terms of absence of cardiac impulse, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	19	23	42	19	14	33	17	7	24
Older age group	14	19	33	46	24	70	106	50	156
Total	33	42	75	65	38	103	123	57	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	27	62	89	19	16	35
Older age group	15	17	32	20	21	41
Total	42	79	121	39	37	76

A = Number of individuals with gross diminution or absence of cardiac apical impulse.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXXII.

b.

Numbers of men and women in terms of absence of cardiac apical impulse, for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	33	65	123	221
B	42	38	57	137
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	12	30	39	81
B	22	57	37	116
T	34	87	76	197

A = Number of individuals with gross diminution or absence of cardiac apical impulse.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXXIII.

a.

Numbers of men and women in terms of diminished cardiac dullness, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	24	18	42	25	8	33	21	3	24
Older age group	24	9	33	47	23	70	139	17	156
Total	48	27	75	72	31	103	160	20	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	34	55	89	25	10	35
Older age group	13	19	32	24	17	41
Total	47	74	121	49	27	76

A = Number of individuals with diminished superficial cardiac dullness.

B = Number of individuals with no such sign.

T = Total number of individuals in group.

TABLE LXXIII.

b.

Numbers of men and women in terms of diminished cardiac dullness, for the whole range of ages by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	48	72	160	280
B	27	31	20	78
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	13	34	49	96
B	21	53	27	101
T	34	87	76	197

A = Number of individuals with distinct diminution of cardiac dullness.

B = Number of individuals without such a sign.

T = Total number of individuals in group.

TABLE LXXIV.

a.

Numbers of men and women in terms of distant cardiac sounds, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	12	30	42	13	20	33	18	6	24
Older age group	14	19	33	39	31	70	99	57	156
Total	26	49	75	52	51	103	117	63	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	23	66	89	13	22	35
Older age group	19	13	32	16	25	41
Total	42	79	121	29	47	76

A = Number of individuals with impaired cardiac sounds on auscultation.

B = Number of individuals with normal strength cardiac sounds.

T = Total number of individuals in group.

TABLE LXXIV.

b.

Numbers of men and women in terms of distant cardiac sounds, by age groups where applicable and by disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
A	26	52	117	195
B	49	51	63	163
T	75	103	180	358

WOMEN

	Disability groups for younger age group				Disability groups for older age group		
	I	II	III	Total	I + II	III	Total
A	7	16	13	36	19	16	35
B	21	45	22	88	13	25	38
T	28	61	35	124	32	41	73

A = Number of individuals with impaired cardiac sounds on auscultation.

B = Number of individuals with no such impairment.

T = Total number of individuals in group.

TABLE LXXV.

a.

Numbers of men and women in terms of diminished liver dullness, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	23	19	42	23	10	33	21	3	24
Older age group	20	13	33	41	29	70	132	24	156
Total	43	32	75	64	39	103	153	27	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	35	54	89	22	13	35
Older age group	11	21	32	21	20	41
Total	46	75	121	43	33	76

A = Number of individuals exhibiting diminished liver dullness.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXXIV.

b.

Numbers of men and women in terms of diminished liver dullness, for the whole age range by disability groups.

MEN	Disability groups for allages			
	I	II	III	Total
A	43	64	153	260
B	32	39	27	98
T	75	103	180	358

WOMEN	Disability groups for all ages			
	I	II	III	Total
A	15	31	43	89
B	19	56	33	108
T	34	87	76	197

A = Number of individuals exhibiting diminished liver dullness.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXXVI.

a.

Numbers of men and women in terms of bronchospasm, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group.III		
	A	B	T	A	B	T	A	B	T
Younger age group	11	31	42	13	20	33	21	3	24
Older age group	13	20	33	28	42	70	105	51	156
Total	24	51	75	41	62	103	126	54	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	37	52	89	23	12	35
Older age group	11	21	32	20	21	41
Total	48	73	121	43	33	76

A = Number of individuals judged to have persistent bronchospasm.

B = Number of individuals not showing this sign.

T = Total number of individuals in group.

TABLE LXXVI.

b.

Numbers of men and women in terms of bronchospasm, for the whole age range by disability groups.

MEN Disability groups for all ages

	I	II	III	Total
A	24	41	126	191
B	51	62	54	167
T	75	103	180	358

WOMEN Disability groups for all ages

	I	II	III	Total
A	13	35	43	91
B	21	52	33	106
T	34	87	76	197

A = Number of individuals judged to have persistent bronchospasm.

B = Number of individuals judged not to have this sign.

T = Total number of individuals in group.

TABLE LXXVII.

a.

Numbers of men and women in terms of apical systolic murmurs, by disability and age groups.

MEN	Disability group I				Disability group II			
	A	B	C	T	A	B	C	T
Younger age group	17	15	8	40	9	12	12	33
Older age group	14	10	9	33	30	21	19	70
Total	31	25	17	73	39	33	31	103

	Disability group III			
	A	B	C	T
Younger age group	5	11	8	24
Older age group	72	48	35	155
Total	77	59	43	179

WOMEN	Disability group I + II				Disability group III			
	A	B	C	T	A	B	C	T
Younger age group	32	24	32	88	14	15	5	34
Older age group	16	9	6	31	16	15	10	41
Total	48	33	38	119	30	30	15	75

A = Number of individuals without any trace of apical systolic murmur.

B = Number of individuals with a grade I murmur.

C = Number of individuals with murmurs of grade II or III.

T = Total number of individuals in group.

TABLE LXXVII.

b.

Numbers of men and women in terms of apical systolic murmurs, for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	31	39	77	147
B	25	33	59	117
C	17	31	43	91
T	73	103	179	355

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	13	35	30	78
B	9	24	30	63
C	12	26	15	53
T	34	85	75	194

A = Number of individuals with no trace of apical murmur.
B = Number of individuals with a grade I apical systolic murmur.
C = Number of individuals with murmurs of grade II or III.
T = Total number of individuals in group.

TABLE LXXVII.

a.

Numbers of men and women in terms of cyanosis, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	4	38	42	7	26	33	8	16	24
Older age group	7	26	33	25	45	70	88	68	156
Total	11	64	75	32	71	103	96	84	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	17	72	89	8	27	35
Older age group	14	18	32	22	19	41
Total	31	90	121	30	46	76

A = Number of individuals with detectable cyanosis in any distribution.

B = Number of individuals not showing cyanosis.

T = Total number of individuals in group.

TABLE LXXVIII.

b.

Numbers of men and women in terms of cyanosis, by age and disability groups.

MEN	Disability groups for younger age group			Disability groups for older age group			
	I + II	III	Total	I	II	III	Total
A	11	8	19	7	25	88	120
B	64	16	80	26	45	68	139
T	75	24	99	33	70	156	259

WOMEN	Disability groups for younger age group			Disability groups for older age group		
	I + II	III	Total	I + II	III	Total
A	17	8	25	14	22	36
B	72	27	99	18	19	37
T	89	35	124	32	41	73

A = Number of individuals with detectable cyanosis of any distribution.
B = Number of individuals without detectable cyanosis.
T = Total number of individuals in group.

TABLE LXXIX.

a.

Numbers of men and women in terms of the occurrence of oedema, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	1	41	42	1	32	33	2	22	24
Older age group	1	32	33	8	62	70	16	140	156
Total	2	73	75	9	94	103	18	162	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	20	69	89	7	28	35
Older age group	12	20	32	18	23	41
Total	32	89	121	25	51	76

A = Number of individuals exhibiting oedema.

B = Number of individuals not showing oedema.

T = Total number of individuals in group.

TABLE LXXIX.

b.

Numbers of men and women in terms of oedema, by age groups where applicable and by disability groups.

MEN

	Disability groups for all ages		
	I + II	III	Total
A	11	18	29
B	167	162	329
T	178	180	358

WOMEN

	Disability groups for younger age group				Disability groups for older age group		
	I	II	III	Total	I + II	III	Total
A	9	11	7	27	12	18	30
B	19	50	28	97	20	23	43
T	28	61	35	124	32	41	73

A = Number of individuals exhibiting oedema.

B = Number of individuals not showing oedema.

T = Total number of individuals in group.

TABLE LXXI.

a.

Numbers of men and women in terms of clubbing beaking or spooning of nails, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	6	36	42	9	24	33	5	19	24
Older age group	7	26	33	24	46	70	52	104	156
Total	13	62	75	33	70	103	57	123	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	10	79	89	7	28	35
Older age group	11	21	32	8	33	41
Total	21	100	121	15	61	76

A = Number of individuals with clubbing or beaking.

B = Number of individuals without any such abnormality.

T = Total number of individuals in group.

TABLE LXXX.

b.

Numbers of men and women in terms of finger clubbing, beaking or spooning, by age groups where applicable and by disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
A	13	33	57	103
B	62	70	123	255
T	75	103	180	358

WOMEN

	Disability groups for younger age group			Disability groups for older age group		
	I + II	III	Total	I + II	III	Total
A	10	7	17	11	8	19
B	79	28	107	21	33	54
T	89	35	124	32	41	73

A = Number of individuals with finger clubbing or beaking.

B = Number of individuals not showing such abnormality.

T = Total number of individuals in group.

TABLE LXXXI.

a.

Numbers of men and women in terms of radial artery thickness, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	31	11	42	23	10	33	14	10	24
Older age group	16	17	33	29	41	70	90	66	156
Total	47	28	75	52	51	103	104	76	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	79	10	89	27	8	35
Older age group	18	14	32	27	14	41
Totak	97	24	121	54	22	76

A = Number of individuals with normal arteries or only slight thickening.

B = Number of individuals with definite thickening or with tortuosity.

T = Total number of individuals in group.

TABLE LXXXI.

b.

Numbers of men and women in terms of radial artery thickness, by age and disability groups.

MEN	Disability groups for younger age group				Disability groups for older age group			
	I	II	III	Total	I	II	III	Total
A	31	23	14	68	16	29	90	135
B	11	10	10	31	17	41	66	124
T	42	33	24	99	33	70	156	259

WOMEN	Disability groups for younger age group			Disability groups for older age group		
	I + II	III	Total	I + II	III	Total
A	79	27	106	18	27	45
B	10	8	18	14	14	28
T	89	35	124	32	41	73

A = Number of individuals with normal arteries or only slight thickening.

B = Number of individuals with definite thickening or with tortuosity.

T = Total number of individuals in group.

TABLE LXXXII.

a.

Numbers of men and women in terms of deficiency of dorsalis pedis pulsation on either side, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	9	33	42	8	25	33	4	20	24
Older age group	6	27	33	26	44	70	43	113	156
Total	15	60	75	34	69	103	47	133	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	28	61	89	11	24	35
Older age group	7	25	32	11	30	41
Total	35	86	121	22	54	76

A = Number of individuals with deficient dorsalis pedis pulse, on either side.

B = Number of individuals with normal pulsation.

T = Total number of individuals in group.

TABLE LXXXII.

b.

Numbers of men and women in terms of deficient dorsalis pedis pulsation on either side, for the whole age range by disability groups.

MEN — Disability groups for all ages

	I	II	III	Total
A	15	34	47	96
B	60	69	133	262
T	75	103	180	358

WOMEN — Disability groups for all ages

	I	II	III	Total
A	6	29	22	57
B	28	58	54	140
T	34	87	76	197

A = Number of individuals with deficient dorsalis pedis pulse, on either side.

B = Number of individuals with normal pulsation.

T = Total number of individuals in group.

TABLE LXXXIII.

a.

Numbers of men and women in terms of deficiency of posterior tibial pulsation at the ankle on either side, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	4	38	42	3	30	33	1	23	24
Older age group	2	31	33	18	52	70	20	136	156
Total	6	69	75	21	82	103	21	159	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	32	57	89	12	23	35
Older age group	12	20	32	14	27	41
Total	44	77	121	26	50	76

A = Number of individuals with deficient posterior tibial pulsation, on either side.

B = Number of individuals with normal pulsation.

T = Total number of individuals in group.

TABLE LXXXIII.

b.

Numbers of men and women in terms of deficiency of posterior tibial pulsation, by disability groups for the whole age range.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	6	21	21	48
B	69	82	159	310
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	13	31	26	70
B	21	56	50	127
T	34	87	76	197

A = Number of individuals with deficient posterior tibial pulsation, on either side.

B = Number of individuals with normal pulsation.

T = Total number of individuals in group.

TABLE LXXXIV.

a.

Numbers of men and women in terms of the occurrence of varicose veins, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group. III		
	A	B	T	A	B	T	A	B	T
Younger age group	7	35	42	9	24	33	4	20	24
Older age group	17	16	33	21	49	70	43	113	156
Total	24	51	75	30	73	103	47	133	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	29	60	89	8	27	35
Older age group	17	15	32	21	20	41
Total	46	75	121	29	47	76

A = Number of individuals with varicose veins, present or previous.

B = Number of individuals without any such history.

T = Total number of individuals in group.

TABLE LXXXIV.

b.

Numbers of men and women in terms of the occurrence of varicose veins, by age and disability groups.

MEN	Disability groups for younger age group			Disability groups for older age group			
	I	II+III	Total	I	II	III	Total
A	7	13	20	17	21	43	81
B	35	44	79	16	49	113	178
T	42	57	99	33	70	156	259

WOMEN	Disability groups for younger age group				Disability groups for older age group		
	I	II	III	Total	I + II	III	Total
A	6	23	8	37	17	21	38
B	22	38	27	87	15	20	35
T	28	61	35	124	32	41	73

A = Number of individuals with varicose veins, present or previous.

B = Number of individuals without any such history.

T = Total number of individuals in group.

TABLE LXXXV.

a.

Numbers of men and women in terms of abnormal fundi, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	6	36	42	4	29	33	3	21	24
Older age group	9	24	33	25	45	70	41	115	156
Total	15	60	75	29	74	103	44	136	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	18	71	89	10	25	35
Older age group	10	22	32	14	27	41
Total	28	93	121	24	52	76

A = Number of individuals judged to have abnormality of optic fundus.

B = Number of individuals judged to have normal fundi.

T = Total number of individuals in group.

TABLE LXXXV.

b.

Numbers of men and women in terms of abnormal fundi, for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	15	29	44	88
B	60	74	136	270
T	75	103	180	358

WOMEN

	Disability groups for all ages			
	I	II	III	Total
A	9	19	24	52
B	25	68	52	145
T	34	87	76	197

A = Number of individuals judged to have abnormality of optic fundus.

B = Number of individuals judged to have normal fundi.

T = Total number of individuals in group.

TABLE LXXXVI.

a.

Numbers of men and women in terms of the occurrence of hernia, by disability and age groups.

MEN	Disability group I			Disability group II			Disability group III		
	A	B	T	A	B	T	A	B	T
Younger age group	3	39	42	4	29	33	5	19	24
Older age group	10	23	33	13	57	70	44	112	156
Total	13	62	75	17	86	103	49	131	180

WOMEN	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	4	85	89	2	33	35
Older age group	2	30	32	7	34	41
Total	6	115	121	9	67	76

A = Number of individuals with past or present hernia at any site.

B = Number of individuals never having had hernia.

T = Total number of individuals in group.

TABLE LXXXVI.

b.

Numbers of men and women in terms of the occurrence of hernia, for the whole age range by disability groups.

MEN

	Disability groups for all ages			
	I	II	III	Total
A	13	17	49	79
B	62	86	131	279
T	75	103	180	358

WOMEN

	Disability groups for all ages		
	I + II	III	Total
A	6	9	15
B	115	67	182
T	121	76	197

A = Number of individuals with past or present hernia at any site.

B = Number of individuals never having had a hernia.

T = Total number of individuals in group.

TABLE LXXXVII.

a.

Numbers of men and women in terms of the occurrence of thyroid enlargements, by disability and age groups where applicable.

MEN

	Disability group III		
	A	B	T
Younger age group	2	22	24
Older age group	5	151	156
Total	7	173	180

None in disability group I.

A single man of older age group, in disability group II.

WOMEN

	Disability group I + II			Disability group III		
	A	B	T	A	B	T
Younger age group	11	78	89	4	31	35
Older age group	3	29	32	1	40	41
Total	14	107	121	5	71	76

A = Number of individuals with past or present thyroid enlargement.

B = Number of individuals without any such history.

T = Total number of individuals in group.

TABLE LXXXVII.

b.

Numbers of women in terms of thyroid enlargement, by disability groups for the whole age range.

WOMEN	Disability groups for all ages			
	I	II	III	Total
A	7	7	5	19
B	27	80	71	178
T	34	87	76	197

A = Number of individuals with obvious thyroid enlargemnet or a history previously.

B = Number of individuals free of any such history.

T = Total number of individuals in group.

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