SMOKING HABITS OF WINNIPEG SCHOOL CHILDREN*

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Lung cancer has increased at an alarming rate, greater than any other major disease. Table I illustrates the increase in the male death rate over an eight-year period in Canada (10) and compares it with that for all other forms of cancer. This represents a 48% increase in male lung cancer compared with a slight decrease in the total deaths from all other forms of cancer. In 1960 Winnipeg (8) had 80 deaths from lung cancer. There were 43 deaths from traffic accidents, 12 from tuberculosis in the same year and 35 deaths from poliomyelitis in 1953 when Winnipeg suffered one of the most severe poliomyelitis epidemics recorded in any North American city.

In 1958 vital statistics reports (10) for Canada, the latest available, there are 2263 deaths from primary lung cancer, and 1845 from all infectious diseases including tuberculosis. The figures for males alone are even more striking: 1972 lung cancer deaths to 1149 from all infectious diseases. In males the lung is now the most common site of primary cancer.

TABLE I.—A Comparison of Male Deaths from Cancer of Lung with Male Deaths from All Other Forms of Cancer, Canada 1951 - 1958

Year	*Cancer* of lung*	*Rate per 100,000 population*	*All other† cancer*	*Rate per 100,000 population*
1951.....	1095	15.4	8314	117.3
1952.....	1251	17.1	8874	121.6
1953.....	1383	18.5	8941	119.6
1954.....	1498	19.5	9211	119.9
1955.....	1621	20.6	9564	121.3
1956.....	1775	21.8	9749	119.6
1957.....	1849	22.0	9891	117.5
1958.....	1972	22.8	9994	115.6

*International Intermediate List No. A50.
†All neoplasms except A50.

Even with present case-finding methods, surgery and other treatment, lung cancer still has a case fatality rate of more than 95% It is, therefore, essential that serious consideration should be given to methods of prevention.

The Medical Research Council of Great Britain (14), the Surgeon General of the United States Public Health Service (3) and the American Cancer Society (16) have all stated that there is sufficient evidence to establish a causal relationship between cigarette smoking and lung cancer. They and others (4,5,12) have, therefore, advised the launching of educational campaigns to reduce smoking. In view of this, the City of Winnipeg Health Department in conjunction with the School Board decided to investigate present methods of education about smoking. As an initial step we decided to survey the present smoking habits of Winnipeg School Children from grade five to grade twelve, inclusive. We felt that this would give us information about the pattern of cigarette smoking in Winnipeg school children, the age at which smoking first started and a baseline standard with which to compare the results of any educational program.

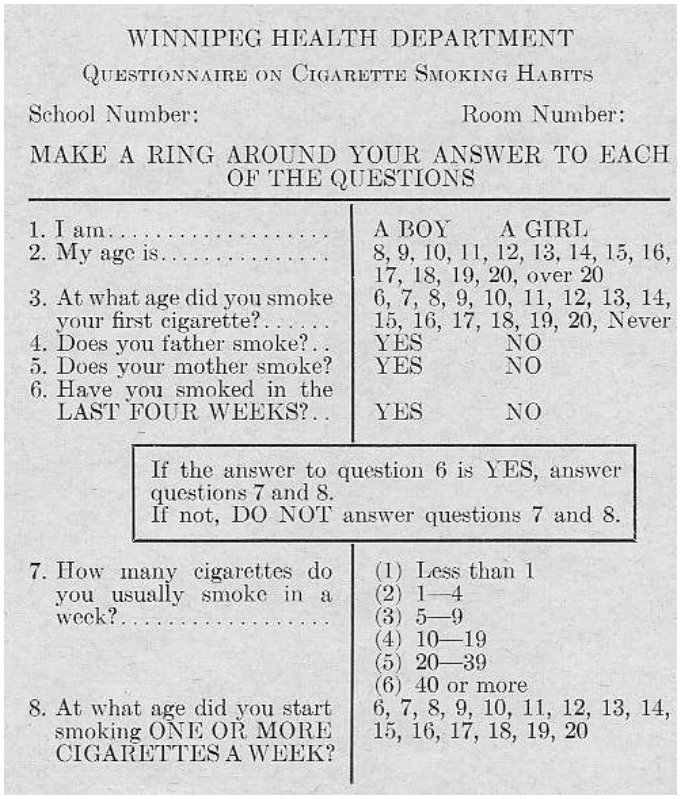
MATERIALS AND METHODS

The population surveyed consisted of an estimated 25,103 students in grades five to twelve inclusive. The survey was carried out in May 1960, and consisted of submitting a questionnaire to the school children. This questionnaire was similar to that used by the London School of Hygiene. (13)

The authors explained the questionnaire and its purpose to the principals of the schools, who in turn interpreted it to the teachers who administered the questionnaire in the classrooms. The questionnaires were answered anonymously. Replies were made by circling the appropriate answer and the students were informed that they could leave out any questions they wished. This was to avoid any charges of prying into the private lives of the children and their parents. The completed questionnaires from each classroom were placed in an envelope and the academic grouping of the class (e.g. Average, Above Average, Major Work, etc.) was marked on the envelope by the principal or teacher. The data from each questionnaire (as shown) were placed on an IBM punch card.

A repeat survey in a 2% sample of classrooms selected to give the same distribution of sex and grades as the total survey was carried out with the authors administering the questionnaire. This was done as a check on the validity of the answers in the original survey. As it was impossible to complete this repeat survey before the end of the term, it was done in the fall, and the comparison made with equivalent rather than identical classes.

In order to allow for considerable age and sex variation in the different academic groups we calculated "Comparative Smoking Indices" similar to the "Comparative Mortality Indices" used in studies on mortality rates of specific groups to rule out effects of different age and sex distribution. The proportion of smokers for each age group in the two sexes was calculated for all students irrespective of academic grouping. The figures obtained were then applied to the academic groups separately to give an "expected" number of smokers on the hypothesis that the variation of the number of smokers in each group was attributable solely to the variation in age composition. The "Observed" number of smokers as obtained from the results of the questionnaire was then compared with the "expected" number of smokers. The comparative smoking index was obtained by dividing the observed number of smokers by those expected.



WINNIPEG HEALTH DEPARTMENT

QUESTIONNAIRE ON CIGARETTE SMOKING HABITS

School Number: Room Number:

MAKE A RING AROUND YOUR ANSWER TO EACH OF THE QUESTIONS

1. I am.....	A BOY A GIRL
2. My age is.....	8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, over 20
3. At what age did you smoke your first cigarette?.....	6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, Never
4. Does you father smoke?..	YES NO
5. Does your mother smoke?	YES NO
6. Have you smoked in the LAST FOUR WEEKS?..	YES NO

If the answer to question 6 is YES, answer questions 7 and 8.
If not, DO NOT answer questions 7 and 8.

7. How many cigarettes do you usually smoke in a week?.....	(1) Less than 1 (2) 1—4 (3) 5—9 (4) 10—19 (5) 20—39 (6) 40 or more
8. At what age did you start smoking ONE OR MORE CIGARETTES A WEEK?	6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Comparative Smoking Index = Observed Smokers / Expected Smokers.

Unity indicates that the proportion smoking in that group was the same as for all students combined, i.e. it represented an average smoking rate. Values greater than unity indicate a smoking rate greater than average; values below unity, less than average.

The large number used in this survey gave figures which were highly significant on the chi square test. Conclusions are based on this test.

RESULTS

A total of 22,386 questionnaires were returned and of these 502 were rejected. Twelve from a special class for partially sighted children and 20 from a class of new immigrants learning English were rejected, as these two groups could not be classified into grade and academic achievement. The other 470 were rejected because of incompleteness. Twenty-five had not stated a sex, and 36 did not state an age; 100 gave sex and age, and answered questions on their parents' smoking habits, but did not answer any questions about their own smoking habits and were possibly non-smokers. In all 21,884, or 97.7%, of the questionnaires were used, representing returns from 87.2% of the student population studied. Returns diminished with the higher grades: grades five and six, 91.5%; seven to nine, 89.8%; and ten to twelve, 83.854c. Throughout this report all references to smokers means smoking one or more cigarettes a week unless otherwise stated. This is the criterion used by Horn et al. of the American Cancer Society.12

Fig. I and Table II show the general smoking pattern. The grades are grouped according to the pattern in the Winnipeg schools. Grades five and six are the final years of the "elementary schools" and the typical age in these grades would be 11 and 12 in May at the end of the school year. Grades seven, eight and nine are grouped as "junior high" in this city, and typical ages would be 13 to 15 years of age. The grades ten, eleven and twelve make up the "high school" classes. Generally the elementary, junior high, and high schools are separate institutions, although there are some combined junior and senior high schools. There are also 97 boys and 78 girls listed as "ungraded"; these students are in special ungraded classes for children of low I.Q. and their age and grading cannot be fitted into the other groups.

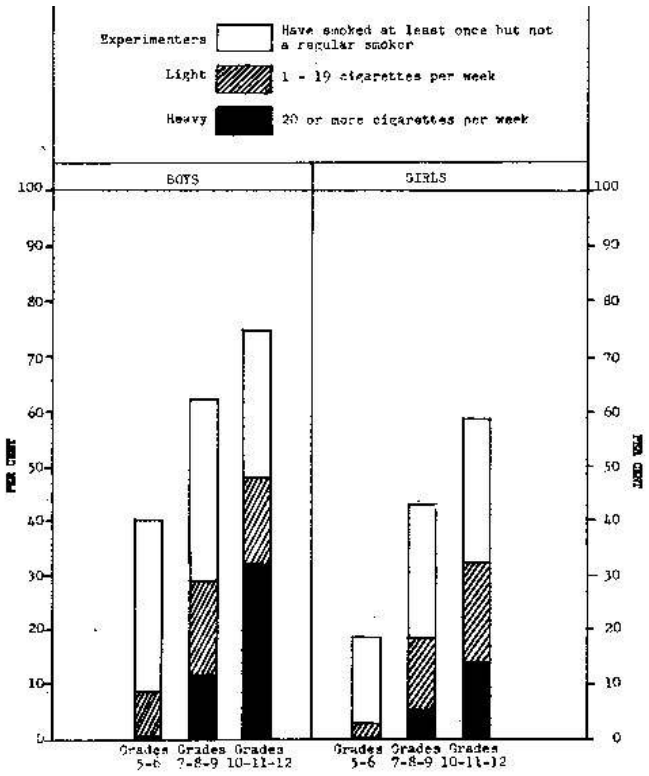


Fig. 1.—Smoking habits of Winnipeg school children. A study of 21,884 Winnipeg school students grades 5-12 inclusive, May 1960.

TABLE II.—Smoking Habits of Winnipeg School Children. A Study of 21,884 Winnipeg School Students Grades 5 - 12 Inclusive, May 1960

	Boys				Girls			
	Grades 5 - 6	*Grades 7 - 8 - 9*	*Grades 10 - 11 - 12*	*Ungraded*	*Grades 5 - 6*	*Grades 7 - 8 - 9*	*Grades 10 - 11 - 12*	*Ungraded*
Number in group	3544	4897	2737	97	3497	4702	2332	78
Never smoked	59.5%	37.6%	25.2%	29.9%	81.3%	56.9%	41.4%	57.7%
Had smoked, but not in last 4 weeks	31.8%	33.1%	26.8%	35.1%	15.6%	24.5%	26.2%	7.7%
Number smoked per week in last 4 weeks by those who smoked:								
Less than 1	2.9%	3.9%	3.3%	7.2%	1.1%	3.1%	4.2%	3.8%
1 - 4 per week	3.4%	5.6%	4.0%	12.4%	1.3%	4.3%	5.3%	9.0%
5 - 9	1.0%	3.6%	3.2%	1.0%	0.4%	2.9%	4.0%	7.7%
10 - 19	0.7%	4.6%	5.3%	5.1%	0.1%	2.9%	4.9%	7.7%
20 - 39	0.5%	5.1%	8.8%	6.2%	0.1%	2.9%	5.7%	5.1%
40 or more	0.2%	6.5%	23.4%	3.1%	0.1%	2.5%	8.3%	1.3%
Total (one or more per week)	5.8%	25.4%	44.7%	27.8%	2.0%	15.5%	28.2%	30.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

In Fig. I the bars indicate the per cent of students in each group who have smoked. The space between the top of the bar and the top of the chart, therefore, indicates the proportion of students who have never smoked. Students who have smoked but were not smoking at the time of the survey are listed as "experimenters" on the chart. Those smoking regularly were arbitrarily subdivided into "light" smokers if smoking 1-19 cigarettes a week, and "heavy" smokers if smoking 20 cigarettes or more a week.

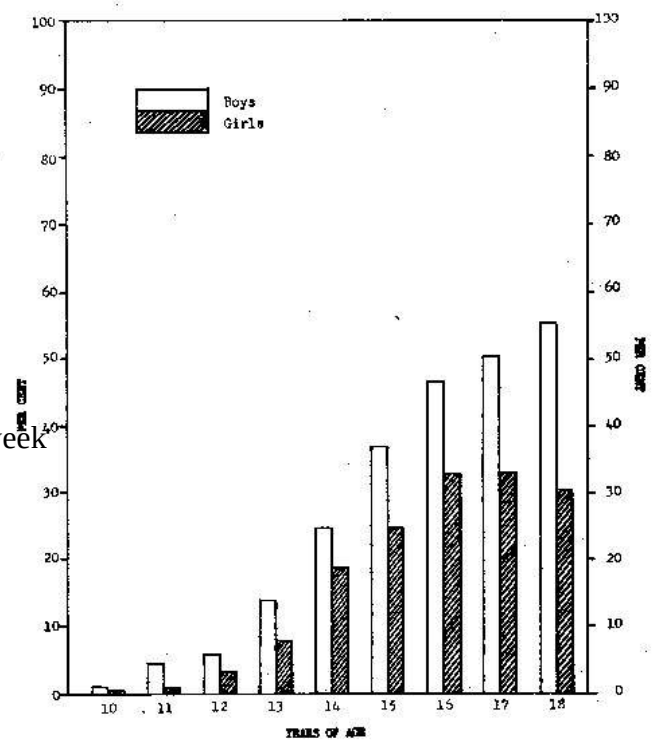


Fig. 2.—Per cent of students who smoke more than one cigarette a week by age and sex.

Boys smoke more than girls in all grades. In elementary grades regular smoking was very light although present, but about 40% of the boys and 18% of the girls have smoked their first cigarette. In junior high school, smoking is not at all uncommon, 25.4% of the boys and 15.5% of the girls smoking regularly. In high school 44.7% of the boys and 28.2% of the girls stated that they smoked regularly.

Table III shows this increase by age and sex rather than by grade. It is seen that the greatest increase occurs between 13 and 16 years of age (the junior high school age group). There is also a shift to heavier smoking with increasing grades (Table II), and Table IV shows these figures by age for boys alone. This indicates that the median figure for the amount of smoking lies in the 1-4 cigarettes per week range for boys under 14 years of age. It then increases to 40 or more per week by 17 years of age.

TABLE III.—Survey of Smoking Habits of 21,884 Winnipeg School Children, May 1960

(a) Students who smoke more than one cigarette a week by age and sex.
(b) Ratio of girls to boys in the school population by age.

	BOYS			*GIRLS*			
		Smoked more than one a week			*Smoked more than one a week*		
Age (1)	*Total* (2)	*Number* (3)	*%* (4)	*Total* (5)	*Number* (6)	*%* (7)	*Ratio of girls to boys* (8)
9	29	1	3.44	57	—	—	1.96
10	731	8	1.09	803	3	.37	1.10
11	1394	60	4.30	1485	14	.94	1.07
12	1622	95	5.86	1731	55	3.17	1.07
13	1893	259	13.68	1725	135	7.82	.91
14	1387	339	24.44	1406	260	18.49	1.01
15	1319	486	36.84	1218	299	24.55	.92
16	1243	582	46.82	1193	393	32.94	.96
17	971	487	50.15	766	252	32.90	.79
18	480	265	55.21	181	55	30.39	.38
19	155	87	56.13	39	9	23.08	.25
20	25	13	52.00	2	—	—	.08
20 plus	26	21	80.77	3	2	66.67	.12
TOTAL	11,275	2703	23.97	10,609	1477	13.92	.94

TABLE IV.—Boys by Age Who Have Smoked in the Last Four Weeks

	Number of cigarettes smoked per week						
Age	*Less than one*	*1 - 4*	*5 - 9*	*10 - 19*	*20 - 39*	*40 or more*	*Total*
9	1*					1	2
10	13*	6	2				21
11	45	47*	6	2	4	1	105
12	46	55*	20	10	6	4	141
13	82	114*	58	34	33	20	341
14	69	92	63*	75	59	50	408
15	54	86	52	105*	115	128	540
16	40	60	58	81	137*	246	622
17	30	31	31	52	105	268*	517
18	5	16	10	28	35	176*	270
19	4	9	3	9	17	49*	91
20		2		1	1	9*	13
20 plus	1		1	1	2	17*	22
	390	518	304	398	514	969	3093

*Indicates column in which the median figure for number of cigarettes at each age will fall.

The relationship between parental smoking habits and those of the children is shown in Table V and Fig. 3. Even where neither parent smokes, 20.8% of the boys had smoked in the last four weeks. This proportion was increased by about 38% when either or both parents smoked, but

TABLE V.—Relationship Between Smoking Habits of Students and Those of Their Parents

A Study of 21,527 Winnipeg School Students, Grades 5 - 12 Inclusive, May 1960

	Boys				*Girls*			
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
	Father smokes	*Mother smokes*	*Both parents smoke*	*Neither parent smokes*	*Father smokes*	*Mother smokes*	*Both parents smoke*	*Neither parent smokes*
Number of students	3536	994	4518	2055	3241	876	4398	1909
Never smoked	40.1%	39.6%	41.1%	45.4%	63.5%	57.8%	58.2%	69.0%
Smoked, but not in last 4 weeks	31.9%	31.6%	29.5%	33.8%	21.7%	22.5%	22.2%	19.9%
Smoked in last 4 weeks	28.0%	28.8%	29.4%	20.8%	14.8%	19.7%	19.6%	11.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

there was no real difference in boys' habits with the different positive smoking habits of the parents.

Fewer girls smoke when neither parent smokes than when parents smoke, and the girl is much more closely tied to her mother's smoking habits. Her smoking is increased by 33% when the father is the lone smoker, but by 76% when the mother or both parents smoke.

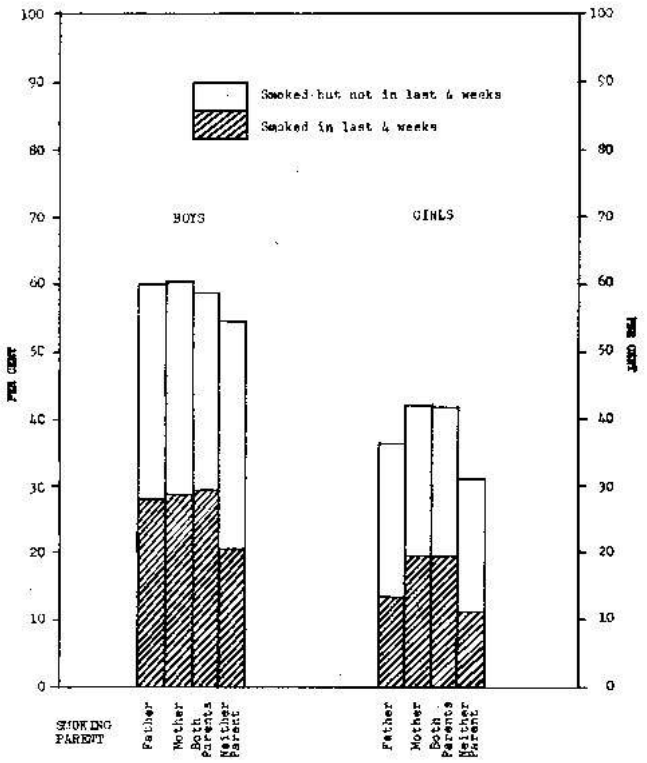


Fig. 3.—Relationship between smoking habits of students and those of their parents.

Information on the smoking habits of the parents as given by the students is shown in Table VI. There was no statistical difference between the answers of boy and girl students. Only 18.41% of the students have no parent smoking. There was no question asked as to smoking amongst other household adults, such as older siblings and relatives, so that absence of smoking at home probably occurs in even less than 18% of families. The most common pattern was, for both parents to smoke, and next for the father alone to smoke. In less than 9% of the homes the mother was the only parent smoking. The combined figures indicate that almost 73% of the adult male parents and 50% of the mothers smoke.

Smoking habits of students have an inverse relationship with academic achievement (Table VII). This inverse relationship is shown more strongly in girls. The ungraded classes do not conform to this pattern in either sex but the numbers are very small.

TABLE VI.—Smoking Habits of Parents of 21,527 Students (357 students did not answer this question)

Smokes	*Number*	*%*
1. Father alone	6777	31.48
2. Mother alone	1870	8.68
3. Both parents	8916	41.41
4. Neither parent	3964	18.41
TOTAL	21,527	100.00
5. Father (1 + 3)	15,693	72.89
6. Mother (2 + 3)	10,786	50.10

The repeat survey done in September 1960 was tabulated only as in Table II, and compared with a similar tabulation of equivalent classes from the same schools in the original survey. The patterns were quite similar throughout and there was no statistical difference in the results.

Students were asked "At what age did you smoke your first cigarette?" Tabulation of the answers to this question is complex, as the age at which the question was asked must be taken into account. However, 565 stated that they had smoked by six years of age, and an additional 975 by

TABLE VII.—Comparative Smoking Index by Academic Standard and Sex of 21,884 Winnipeg School Students Grades 5 - 12 Inclusive, May 1960

Type of class	Boys				Girls			
	Total number	*Smokers*	*Expected No. of smokers*	*C.S.I.**	*Total Number*	*Smokers*	*Expected No. of smokers*	*C.S.I.**
Honours	183	26	77	0.34	175	17	51	0.33
Major work	410	23	47	0.50	344	11	28	0.39
Above average	2011	224	362	0.62	2342	150	265	0.57
Average	5780	1403	1407	1.00	5518	812	811	1.00
Below average	2528	867	696	1.25	1955	376	276	1.36
Slow learners	266	129	86	1.50	197	85	43	1.96
Ungraded	97	31	30	1.04	78	26	16	1.59

*Comparative smoking index.

Comparative smoking index is obtained by applying the observed number of smokers to the expected number of smokers.

The expected number of smokers is calculated by applying the age and sex specific smoking rates of the entire tested school population to the age and sex specific population in the specific subgroup under study.

eight years of age.Discussion

1. Conduct of Survey

The announcement of the proposed survey was met by editorial criticism in both Winnipeg daily newspapers. The chief criticism was that we were prying into the private lives of the parents through their children in the questions on parental smoking habits. It was also suggested that such a survey might lead to further surveys with more detailed and intimate questions. The questionnaire from the start was to be answered anonymously. In order to avoid the criticism of prying, students were told that they could leave out answers to questions to which they objected. However, the number of unanswered questions was negligible, 98.4% answering the most contentious question, that on parental smoking. No criticism of the survey was received by the Health Department from parents, and several commendations of the project were received from parents and interested persons. The second "fear" was fulfilled in the fall of 1960 when the Alcohol Education Committee requested permission to conduct a survey in the schools. Their request was refused by the elected School Board.

2. Validity of Results

The questions were kept to a minimum, only eight being asked. They were simple questions, which could be answered by circling the correct answer. Most of the questions were about present habits which the student would be expected to know without having to recollect. There was one question with reference to the age at which the student first smoked, and a second which asked at what age be began to smoke regularly. There was no provision for the answer "don't know" concerning parental smoking, or "separated from parent". We realize now that this should have been included. A frequent query from the students was "What shall I put if my parent used to smoke, but quit?" These students were advised to answer that their parent did not smoke.

With the exception of these questions, therefore, we feel that the student would have no trouble knowing and giving the correct answer. The anonymity of the answers was stressed to assure confidential replies. It might be expected that some of the students would take the survey lightly, but only one questionnaire had obviously "smart alec" replies. It had been hoped that the repeat

survey, which was very carefully carried out by the two authors, would be done within the same school term so that the comparisons would be with the same students. In this case almost identical results would have been expected if original and second answers had both been accurate. Owing to unexpected delays in getting the survey under way, the repeat survey could not be done in the same term, and the comparison with equivalent classes gave no indication that previous results were out of order. A breakdown of the results into different districts showed similar patterns in each district studied. A Norwegian (15) study was followed by a sample personal interview study and it was found that, if anything, personal interviews yielded a higher, percentage of positive answers as to smoking history.

3. Development of Smoking

The increase in smoking in the 13-16 age group is similar to findings in other surveys (2,7,9,11-13,15) It is difficult to make quantitative comparisons with other surveys because of the differences in the school systems and slightly different criteria in the definitions of "smoking". A publication of the American Cancer Society' quotes a report that 16% of 13-year-olds smoke and 52% of 18-year-olds. Our figures for these ages in males are 13.68%and 55.21% respectively.

The study of smoking habits of the University of British Columbia (9) students is the only one which we have noted that does not show a lighter smoking pattern among females than males, but their study was a select group. The European studies seem to show a lighter smoking pattern in both sexes but this is difficult to assess. However, they do seem to show this much more markedly in girls, i.e. European girls smoke less in proportion to boys than in North America.

The levelling off of the percentage of girls who smoke after 16 years of age probably can be explained by a change in the make-up of the female school population at this age level. In Manitoba there is compulsory school attendance to the age of 16. As indicated in column 8 of Table III, girls drop out of school much more rapidly after 16 than do boys. A study of the school census shows that the decrease in girls at school occurs mostly in the lower academic groups where the Comparative Smoking Index indicates that the smoking habit is strongest. It is probable that if these girls had not left school their influence on the survey would have been to show a continuing increase.

4. Relationships of Smokers

In addition to the questions on present smoking habits to illustrate the present pattern in the schools, attempts to elicit reasons for smoking were made by asking about parental smoking habits and by comparison of smoking in different academic classifications. Our findings with both these relationships are similar to other studies. The girls show a more marked influence by parental smoking habits, particularly of their mothers. They also show the decrease in smoking with higher academic standing, and vice versa, more markedly than do boys.

Our study does not indicate whether academic success affects smoking, or whether smoking affects academic success, but it is most likely that the former is the case. Others (6,12) have shown that students who were successfully involved in extracurricular sports and social activities

also smoke less and that there is an association between nonsmoking and industriousness, ambition, asceticism and religious observance.

It is difficult to say that the pattern of adult smoking among the parents is that for all adults. However, a British survey of adults showed that 74% of males and 37% of females were currently smoking.

The responses to retrospective questions as to smoking first cigarettes and onset of regular smoking are not as reliable as the responses to the other questions. A considerable number had smoked their first cigarette by six years of age and the following two years. Children at these ages, like everyone else, are subjected to cigarette advertising on television and radio and the influence of smoking at home, and it is quite reasonable to expect an interest in the subject at an early age, the more venturesome experimenting with smoking if the opportunity arises.

CONCLUSIONS

A considerable number of students have smoked their first cigarette as early as six years of age. Therefore, the subject of smoking is in the minds of some students from school entrance and some casual reference to the subject is in order throughout elementary school.

An active program of smoking education should be carried out in the junior high schools. Particular stress is needed in the classes of lower academic standing, and among boys.

Smoking education starting after 16 years of age is probably too late in many cases. It will also miss those who drop out of school because of poor academic standing, and these appear to be the ones most in need of such education.

SUMMARY

Current medical thinking indicates that lung cancer, which accounts for a fifth of all male cancer, is a potentially preventable disease through reduction in smoking, particularly cigarette smoking.

As a preliminary step to the introduction of a more realistic health education program designed to curb the incidence of cigarette smoking, a survey of the smoking habits of' 21,884 Winnipeg school children was completed in May 1960.

The survey indicated that some children began to smoke very early and that the greatest increase was in the 11-16 year age-group. Students are influenced by their parents' smoking habits, and smoking is inversely related to academic achievement.

Health education to prevent the adoption of the smoking habit must begin earlier than has been the practice and must be more closely related to present scientific knowledge. It must involve the youngest children in a casual way. Emphasis must be directed to the early teenage student.

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