SMOKING HABITS AMONG SCHOOL CHILDREN IN NORWAY

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Mortality from lung cancer among urban males has in the last 20 years risen 10-fold in Norway. This fact, seen in relation to the connexion between smoking and lung cancer, makes excessive smoking a serious problem. Understanding the difficulty of making an adult habitual smoker stop smoking, the Norwegian Cancer Society has found it necessary to begin preventive work among the young.

A Committee on the Smoking Habits of Young People was therefore appointed by the Society in 1956. The committee decided to make a survey of smoking habits among children and teen-agers before embarking on an anti-smoking campaign. The methods used and some of the results of this survey are described in the present paper. A more detailed analysis of the material, especially with respect to motivational factors, is to be published elsewhere (Nilsen).

Many surveys have been made in the last few years of smoking habits among groups of adults, but only a few of them specify smoking habits among young people.

Kreyberg (1954) used 15-24 years as the lowest age group in his sample from Norway. This is a very wide range, and as the sample consists of seven special groups from the population, it does not provide a representative picture of the smoking habits of Norwegian youth.

In other surveys outside Norway the age group 15-19 years has been the lowest represented in the sample, or the respondents have been asked when they began to smoke. Hamtoft and Lindhart (1955, 1956) made a nationwide survey of smoking habits among adults in Denmark, Ossadnik (1954, 1955) in Austria, Haenszel, Shimkin and Miller (1956) in the United States, and Tuyns (1956) in an urban

population in Belgium; all these authors used the range of 15 to 19 years as the lowest age group either for current smoking or for the age when the respondents began smoking.

Very few surveys have been concerned with children and young people only, Dybdahl (1957) studied smoking habits among school children in the town of Stavanger, Norway, and the rural districts surrounding it. In Sweden a nationwide survey was made of smoking habits among school children from 10 to 18 years of age (Skolungdomens Roekvanor, 1956). Smoking habits were included in two Danish surveys of youth (Ungdomskommissionen, 1951; Alkjaer, 1956). Jones (1957) made a study of smoking habits among boys in a British secondary school.

Of these surveys the Swedish report has the advantage both of being nationwide and of providing enough data to allow smoking habits at each year of age to be estimated.

The present survey aimed at acquiring information about smoking habits at each year of age from 13 to 19 in the whole of Norway, and is therefore in this respect more like the Swedish survey than any of the others mentioned above.

MATERIAL AND METHODS

The data were gathered through questionnaires. In order to check the answers and to get more information about smoking habits, a sample of the respondents was also interviewed.

It is difficult to make a survey of smoking habits among children. It is undesirable to mail the questionnaires because the respondents should preferably not know the questions beforehand. As many of the

respondents are probably "not allowed" to smoke by their parents, an interview at home is not desirable because the parents must not know the answers. The respondents should be able to answer the questions so that no one except perhaps the interviewer knows from whom the individual answers come.

The simplest way to do this is to let the respondents answer the questionnaire anonymously in school, without knowing the questions beforehand, or to interview them one at a time in a separate room in school. By this method only the smoking habits of school children will be surveyed. In spite of this handicap, however, this method was used in the present study. To make a nationwide and reliable survey of smoking habits among all young people, including those who had left school, would have been very expensive and it would have been more difficult to check the reliability of the answers.

Another and more important reason for surveying smoking habits among school children only, is that the practical aim of the survey was to make an anti-smoking campaign more effective. As a campaign of this kind has to be carried out primarily through the schools, it is the smoking habits of school children which are of especial interest.

The schools from which the sample of respondents was taken, were of various types, including public primary schools, continuation schools, secondary general schools, folk high schools, and vocational workshop and apprenticeship schools.

The numbers in each age group represented in these schools is obtained by comparing the age distribution in the total population with that of the pupils. The age distribution of the sample of respondents from each type of school is used to estimate the age distribution of all pupils attending that type of school.

When the whole population is compared with the school population, we find as would be expected, that children of 13 to 14 years of age are almost fully represented in the schools, while only 10 per cent. of the 19-year-old group is still attending schools of the types sampled.

Although the population from which the sample is taken is therefore not representative of the whole population of young people, we have tried to make the sample representative of this population of young people at school. We have found this especially necessary for the public primary schools, because most of the age groups sampled are to be found in this type of school.

The schools were classified in the types listed above and sub-divided further into:

- (i) Schools in the capital city, Oslo,
- (ii) Other urban schools,
- (iii) Rural schools.

From the rural public primary schools and continuation schools a cluster sample has been taken, using the rural municipalities as cluster units. For this purpose a systematic sample was drawn of about 5 per cent. of all the rural municipalities. All the pupils in the continuation schools and all the pupils in the Seventh Grade in the public primary schools* in these chosen municipalities then received a questionnaire.

From the cities, excluding Oslo, a two-stage sample was taken, using the urban municipalities as primary sampling units. The sample of municipalities was taken in such a way that the probability that a city would be included was proportional to the number of public primary schools in the city, and from each town appearing in the sample one school was drawn†. This was done by drawing a systematic sample of about 10 per cent. of all the urban public primary schools. Every pupil in the Seventh Grade in the sampled public primary schools received a questionnaire, and in the cities which also had continuation schools, a 10 per cent. sample of classes was taken from this type of school.

While taking a 5 per cent. sample of rural schools and a 10 per cent. sample of urban schools outside Oslo, it was necessary to take a 20 per cent. sample from Oslo to obtain enough respondents to break down the material into the required sex-age groups.

The school inspector of Oslo classified the public primary schools into eastern, western, and central districts, and from each group a simple random sample of schools was taken. A sample of classes from the two continuation schools was taken directly from the schools.

For the secondary schools and the two types of vocational school, a systematic sample of classes was taken from the same municipality as those from which the public primary schools were sampled. A sample of folk high schools was taken directly from these schools for the whole country without further subdivision.

* The Seventh Grade includes about half the 13-year-olds; the rest would be in the Sixth Grade.

† This procedure makes the sample a self-weighting one where we can use a very simple and unbiased estimate.

Table I shows the number of respondents in relation to the total number of pupils in the respective classes.

The secondary general schools have been grouped into schools of Oslo and all other schools in the official statistics on education, as Table I shows. The folk high schools are all rural and most of the vocational schools are urban.

The sex and age distribution of the respondents in the respective school types is shown in Table II.

The questionnaires were distributed to the schools with an introductory letter to the teacher and a

printed guide which the teacher was asked to read aloud to the class. Every pupil was given an envelope in which to put his questionnaire when it was answered. The envelopes were sealed and then collected in a larger envelope which was sent at once by post to the Norwegian Cancer Society. This was done so that the pupils could be sure that the answers would be anonymous and that they could therefore answer honestly with impunity. No name or other identification was written on the questionnaire. All the children who were present in the classes represented in the sample on the day of the test answered the questionnaire.

TABLE I
NUMBER OF RESPONDENTS AND TOTAL POPULATION IN TYPES OF SCHOOL SAMPLED

Type of School		Public Primary (7th Grade)	Continuation	Secondary General	Folk High	Vocational
Sample	(i) Oslo	1,118	391	827		331
	(ii) Other Towns	782	311	2,858		341
	(iii) Rural Districts	1,285	660		387	
	Total	3,185	1,362	3,685	387	672
Population	(i) Oslo	4,421	2,054	8,995		3,090
	(ii) Other Towns	8,180	3,759	40,105		9,005
	(iii) Rural Districts	36,850	20,659		4,015	
	Total	49,451	26,472	49,100	4,015	12,095
Sampling Fraction	(i) Oslo	0.25	0.19	0.09		0.11
	(ii) Other Towns	0.10	0.08	0.07		0.04
	(iii) Rural Districts	0.04	0.03		0.10	
	Total	0.06	0.05	0.08	0.10	0.06

TABLE II
NUMBER OF RESPONDENTS BY TYPE OF SCHOOL, AGE, AND SEX

Sex	Age (yrs)	Type of School					Total Respondents
		Public Primary (7th Grade)	Continuation	Secondary General	Folk High	Vocational	
Male	Under 13	16	—	—	—	—	16
	13	806	1	5	—	—	812
	14	760	258	223	—	4	1,245
	15	56	381	413	2	46	898
	16	—	59	399	27	115	600
	17	—	2	417	53	126	598
	18	—	—	283	36	112	431
	19	—	—	122	6	69	197
	20 and Over	—	—	68	11	91	170
	Total	1,638	701	1,930	135	563	4,967
Female	Under 13	13	—	—	—	—	13
	13	826	1	9	—	—	836
	14	671	173	235	—	—	1,079
	15	36	378	407	5	11	837
	16	1	104	391	57	17	570
	17	—	5	354	104	16	479
	18	—	—	238	52	15	305
	19	—	—	83	16	9	108
	20 and Over	—	—	38	18	41	97
	Total	1,547	661	1,755	252	109	4,324

As mentioned before, a sample of respondents was also interviewed. This sample was taken from the respondents in Oslo from all types of school. The number of such interviews is shown in Table III.

RESULTS

After questions about sex and age, the questionnaire asked the following questions, with instructions to mark only one of the answers and to answer honestly:

DO YOU SMOKE?

- (.) Daily
- (.) Sometimes
- (.) Very seldom
- (.) Never

The answers are shown in Table IV, where respondents who have answered "Sometimes" or "Very seldom" have been called occasional smokers and all types of school in Oslo, other towns, and rural districts were grouped together. The percentages in Table IV were derived from the weighted sums of the number of smokers and non-smokers in each district, using the inverse of the sampling fractions in Table I as the weights in each sex-age group, and dividing by the estimated total population of that group. The formula is simply:

$$P = 100 \sum \frac{r_i}{f_i} / \sum \frac{n_i}{f_i}$$

for each sex-age group, where P is the percentage in the sex-age group in Table IV, r_i is the number of daily smokers, occasional smokers, or non-smokers among the respondents in the district (i), n_i is the total number of respondents and f_i is the sampling fraction, both in the same district and in the same sex-age group. The percentages in Table IV are therefore ratio-estimates of the percentages in the respective sex-age groups in the whole school population comprising the types of school from which our sample has been drawn.

The estimate of the variances and standard errors are very complicated in our sampling design. The sample plan was devised to obtain unbiased estimates with the least possible variances, when practical and economical considerations were also taken into account.

The division into districts should have reduced the variances and the cluster sampling should have increased them in relation to the variances in simple random sampling. There is reason to believe that the intraclass correlation in the clusters will not be very much above zero. The total effect of using district cluster sampling with simple random sampling of clusters from every district should therefore probably be a reduction of the variances in relation to simple random sampling.

In the districts where the clusters have been sampled with probability proportionate to the size of the clusters and with subsampling, the variance will be still more reduced.

TABLE III
NUMBER OF INTERVIEWS IN OSLO, BY TYPE OF SCHOOL, AND SEX

Type of School		Public Primary (7th Grade)	Continuation	Secondary General	Vocational	Total Interviewed
Sex	Male	27	36	39	42	144
	Female	22	50	40	5	117
	Total	49	86	79	47	261

TABLE IV
SMOKING HABITS BY SEX AND AGE (PERCENTAGES)

Sex	Smoking Habits	Age (yrs)						
		13	14	15	16	17	18	19
Male	Daily Smokers	3	7	13	24	35	38	35
	Occasional Smokers	54	51	47	38	27	28	28
	Non-Smokers	43	42	40	38	38	34	37
	Total	100	100	100	100	100	100	100
Female	Daily Smokers	—	—	3	4	11	17	13
	Occasional Smokers	25	36	36	34	34	44	40
	Non-Smokers	75	64	61	58	55	39	47
	Total	100	100	100	100	100	100	100

In most of the districts the clusters have been sampled by systematic sampling and it is difficult to make an estimate of the variance from such a sample. We know that if the serial correlation is greater between adjacent sampling units than between units farther apart, the variance will be reduced by systematic sampling in relation to simple random sampling. Since, however, we have no evidence from our material, it will be safer to assume the same variances as if we were dealing with simple random sampling.

From all these facts we may conclude that, if for every sex-age group we use a simple random sample estimate of the variance, we should in most instances be overestimating the real variance.

Comparing Tables II and IV we find that the smallest number of respondents in the sex-age groups we have used is 108. As the standard error $\sigma = \sqrt{PQ/n}$ is maximum when $P = Q = 50$, we may therefore conclude that for all the percentages in Table IV the standard error will be less than $\sqrt{50 \cdot 50/108} \approx 5$. For most of the sex-age groups it will be about 2.5. This means that, for most of the percentages in Table IV, differences between them will be statistically significant at the 0.01 level if they are not smaller than 10.

For the 13- and 14-year age groups the percentages in Table IV are relatively good estimates of the percentages in the whole population in these age groups. But the higher the age group the more biased are the percentages in the Table as estimates of the percentages in the whole age group.

What Table IV tells us, then, is that, among the adolescents still at school, the percentage of daily smokers increases rapidly with increasing age up to the age of 18 where it appears to reach a temporary maximum. The percentage of occasional smokers decreases with increasing age.

To get an impression of smoking habits among *all* young people, whether at school or not, we may compare the types of school. The number of pupils contributed to our sample by the folk high schools is too small to break down into age groups; for the other types of school Table V shows the percentage of daily smokers among boys by age and type of school.

Relatively few of the pupils in the continuation schools go on to secondary general schools, but they may go to vocational schools or to folk high schools if they continue to go to school at all. A comparison between Tables IV and V, therefore, shows that the increasing proportion of daily smokers with increasing age is probably greater in the whole population

of young people than is shown in Table IV for the school population. Thus, Table V shows that the proportion smoking at ages 14 and 15 is greater in the continuation schools, *i.e.* among pupils relatively few of which will go to another school after leaving the continuation school. With increasing age, therefore, when more and more of the children leave school, there will be relatively fewer smokers left in school, and therefore also fewer in our sample of school children.

TABLE V
PERCENTAGE DAILY SMOKERS AMONG BOYS BY AGE AND TYPE OF SCHOOL

Type of School	Age (yrs)						
	13	14	15	16	18	17	19
Public Primary ..	3	5	—	—	—	—	—
Continuation ..	—	9	14	20	—	—	—
Secondary General ..	—	6	9	24	30	33	25
Vocational ..	—	—	—	26	45	52	52

Table V also shows that there are more smokers in the vocational schools than in the secondary general schools. The pupils in the former group attend school in the evening or one day a week, having full-time jobs as apprentices during the rest of the week. The high incidence of smokers among pupils in this type of school makes it also probable that the percentage of smokers among the senior teen-agers in the population is higher than in our sample of school children. This will be true if the young workers not attending vocational schools smoke as much as those who do.

For the pupils in the public primary schools we may compare urban and rural schools. As Table VI shows, occasional smokers are more common in rural districts than in towns. Analysis of the age

TABLE VI
SMOKING HABITS AMONG PUPILS IN 7th GRADE OF PUBLIC PRIMARY SCHOOLS BY DISTRICT AND SEX (PERCENTAGES)

Sex	Smoking Habits	District		
		(i) Oslo	(ii) Other Towns	(iii) Rural Districts
Male	Daily Smokers ..	4	6	5
	Occasional Smokers ..	45	47	57
	Non-Smokers ..	51	47	38
	Total	100	100	100
Female	Daily Smokers ..	1	1	1
	Occasional Smokers ..	17	18	36
	Non-Smokers ..	82	81	63
	Total	100	100	100

distribution and comparison with the corresponding Swedish survey (Skolungdomens Roekvanor, 1956), the other Norwegian survey among school youth (Dybdahl, 1957), and a Norwegian Gallup poll, shows that this difference is likely to be real, but that it only concerns children under 15 years of age. On the other hand for all daily smokers, and for occasional smokers from 15 years and upwards, the difference is in the opposite direction, and more smokers are found in urban than in rural districts.

Our survey also shows that there are more smokers among the parents of children in towns than in rural districts: in Oslo, other towns, and rural districts, respectively, 85, 81, and 70 per cent. of the school children in the Seventh Grade of public primary schools answered that one or both of their parents smoked.

In Oslo, a comparison of the eastern and western public primary schools shows that 35 per cent. of the pupils in the eastern districts smoked occasionally against 23 per cent. of those in the western districts. Here too the difference is in the opposite direction for smoking among parents. In the eastern schools 82 per cent. of the children answered that their parents were smokers, while the corresponding percentage in the western schools was 91.

The group, described as "Daily smokers" is a very heterogenous one including both heavy smokers and those who smoke only one cigarette a day, as well as cigarette smokers, mixed smokers, and pipe smokers.

In the youngest age group pipe smoking is not very common, but among boys it increases from 2 per cent. at the age of 13 to 13 per cent. at the age of 18.

The daily consumption of cigarettes in each age group is shown in Table VII. The formula for the weighted total mean is the same as the formula on page 8, but r_i is replaced by $\sum_k x_{ik}$, where x_{ik} for each sex age group is the number of cigarettes consumed per day by Respondent k in District (i).

A comparison of Tables IV and VII shows that not only does the number of daily smokers increase with age, but that their consumption increases also. The mean number of cigarettes consumed daily *per respondent* shows therefore a greater increase with increasing age than the mean number of cigarettes *per daily smoker*. Among 19-year-old boys the consumption per respondent is nearly forty times as great as among 13-year-old boys.

TABLE VII
DAILY CONSUMPTION OF CIGARETTES AMONG DAILY SMOKERS, BY AGE AND SEX (PERCENTAGES)

Sex	Number of Cigarettes per Day	Age (yrs)						
		13	14	15	16	17	18	19
Male	1	4	2	—	1	—	—	—
	2	19	22	10	6	4	4	5
	3	56	15	16	7	3	6	1
	4	1	8	14	14	6	5	5
	Total 1-4 ..	80	47	40	28	13	15	11
	5-9	8	45	41	48	45	37	28
	10-14	12	8	10	15	25	25	32
	15-19	—	—	7	7	13	18	21
	20 and More ..	—	—	2	2	4	5	8
	Total ..	100	100	100	100	100	100	100
Female	Mean Number of Cigarettes per Daily Smoker ..	4.2	5.6	7.1	8.1	10.1	10.6	12.0
	1	32	—	8	—	—	—	—
	2	12	11	25	4	21	11	7
	3	12	—	12	26	12	16	7
	4	—	—	—	—	—	—	—
	Total 1-4 ..	56	11	66	57	48	35	30
	5-9	44	54	16	22	37	54	48
	10-14	—	35	12	10	9	11	7
	15-19	—	—	3	4	6	—	15
	20 and More ..	—	—	3	7	—	—	—
	Total ..	100	100	100	100	100	100	100
	Mean Number of Cigarettes per Daily Smoker ..	4.5	8.8	5.6	7.2	6.3	6.5	8.0

Since the survey is cross-sectional, we cannot determine how the consumption varies with increasing age in individuals. But the results make it very probable that the individual trend is from occasional smoking to daily smoking, and then to an ever-increasing daily consumption with increasing age until a maximum is reached.

DISCUSSION

In a survey using questionnaires we have no way of checking the honesty of answers, how well the respondents have understood the questions, and what the correspondents really mean by their answers. The interview material has been used to test the reliability of the written answers.

During an interview one can hope to get at the real meaning of an answer and one can be fairly sure that the answer is honest; the answers from the interviews are therefore more reliable than those to the questionnaires. If the questionnaire answers therefore show the same distribution as the interview answers from the same group of respondents, the reliability of the questionnaire answers is supported.

Table VIII shows a comparison between the interview answers and the questionnaire answers from the respondents in Oslo; there are only slight differences between the two groups, but we may perhaps conclude that boy smokers are more numerous than the questionnaire material shows.

TABLE VIII

COMPARISON BETWEEN INTERVIEW AND QUESTIONNAIRE ANSWERS IN OSLO, BY SEX AND SMOKING HABITS

Sex	Smoking Habits	Questionnaire	Interview
Male	Daily Smokers	25	31
	Occasional Smokers ..	34	38
	Non-Smokers	41	31
	Total	100	100
Female	Daily Smokers	7	3
	Occasional Smokers ..	29	30
	Non-Smokers	64	67
	Total	100	100

It is important to know not only the degree of honesty of the answers, but what the respondents mean by their answers. The definition of daily smokers should be quite clear, but the answers "Sometimes" and "Very seldom" which we have taken together as "Occasional smoking", is open to question. The definition of this group should be clear if the definition of the answer "Never" is clear. But that is not the case. Do the respondents who have answered "Never" mean that they never smoke now or that they have never smoked at any time?

The interviewees who answered "Never" were therefore asked if they had ever tasted a cigarette. To this question many of the respondents answered "Yes". Of the 68 boys interviewed who had answered "Never", 55 had in fact tasted a cigarette, and of the 118 girls, 61 had tasted a cigarette. This means that of all those interviewed, 93 per cent. of the boys had tasted a cigarette or smoke now, and 66 per cent. of the girls. The answer "Never" must therefore mean only that the respondents do not smoke now even if they have tasted a cigarette earlier.

What can the results tell about smoking habits among other young people, apart from school children? We have mentioned before that it is probable that the percentage of smokers increases more rapidly with increasing age in the total population than in the school population. From a Gallup Poll undertaken for the Norwegian Cancer Society we may get material which can tell something about this.

Adults were asked if they smoked and if so how old they had been when they began to smoke daily. The Figures (overleaf) show the cumulative percentage distribution of the answers by age group. The percentages from our survey among school children are shown in the same Figures by hatching.

The trend shown by this figure is quite clear, that those in the younger age groups started smoking at an earlier age than the older ones, at least among women. From the Gallup Poll we would therefore estimate the frequency of daily smokers among children now aged 14 to 19 years as higher than it had been for persons in the older age groups when they were aged 14 to 19 years. The Figures show this to be true only for the lowest age groups among school children. The excess of daily smokers among school children decreases with increasing age from 14 to 19 years until the frequency of smokers in this group is lower than in the Gallup material.

From this we can conclude that our hypothesis that the percentage of smokers increases more rapidly with increasing age in the total population of youth than among school youth is most probably true.

The Figures also show that most of the male smokers, and in the lower age groups the female smokers also, began to smoke between the ages of 13 and 18 years. This is true especially for the younger age groups. The temporary maximum we have found at about 18 years of age in our material is therefore a true maximum; relatively few habitual smokers begin their "smoking career" after that age.

SUMMARY

In a survey of the smoking habits of school children in Norway, 9,291 pupils from various types of school and from 13 to 20 years of age received a questionnaire with questions about their smoking habits.

The results show that occasional smoking is very common, especially among boys. Daily smoking is rarer. The percentage of daily smokers among boys increases from 3 per cent. at the age of 13 to a temporary maximum of 38 per cent. at the age of 18. Among the girls these percentages are 0 and 11.

Among 13 to 14-year-old pupils, occasional smokers are more common in rural districts than in towns, and in Oslo occasional smokers are more common in the eastern districts than in the western districts.

A further analysis of the material and a comparison with the results from an interview study of a sample of the respondents and from a Gallup Poll among adults, shows that these results are reliable, with the following reservations:

(a) The results show only the respondents' smoking habits at the time when the survey was undertaken. Most of the boys had tasted a cigarette earlier even if they did not smoke at the time of the survey.

(b) The results show smoking habits among school children only. Most probably the frequency of smokers is higher in the total population of young people than in the school population and this difference increases with increasing age.

(c) The results show the smoking habits only of those who were aged from 14 to 19 years in 1957. There is a clear tendency from year to year to start smoking at an earlier age.

The frequency of smokers in our survey therefore under-estimates the real frequency, especially with regard to the future, *i.e.* if the trend continues to be as before. This fact should make the results from our survey more convincing and emphasize the seriousness of the problem.

Returning to the difficulties of making an adult habitual smoker stop smoking, it should be clear that the most effective preventive work against lung cancer can be done among those who have not yet become habitual smokers. Our survey has shown

that it is usually at the age of 13 to 18 years that smoking becomes habitual. This has been the case with the present adult smokers and it is true to a greater degree with young people nowadays. Educational preventive work should therefore begin at about 13 years of age and continue to about 18 years of age when the greatest danger of becoming a habitual smoker is over.

I am indebted to the Norwegian Cancer Society's Committee on the Smoking Habits of Young People (Chairman: Chief Physician Fredrik Mellbye) for valuable aid in designing the survey, and especially to chief physician Einar Pedersen for reading and commenting on the manuscript.

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