Smoking and Illness Experience of Student Nurses

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THE evident health hazards associated with smoking have been abundantly described (*1–8*). Increased efforts are now being devoted to preventing the excess mortality attributed to this practice. Morbidity data are also being marshaled (*5, 6, 8–12*) to dissuade the significant segment of society that is still seemingly unmoved by threats merely to the "quantity" of life. And this accent on disability is reinforced by efforts to identify persons who appear particularly disposed both to adopt the smoking habit and to incur the impairments it seems to induce (*6, 13–20*).

This report compares the illness patterns of smokers and nonsmokers in a generally healthy and comparatively homogeneous population of 269 nursing students, who completed 3-year courses from 1954 through 1958 at The Brooklyn Hospital. It also assesses selected biosocial attributes to which cigarette consumption appears to be related and presents limited data on birth weights of these nurses and their children, in light of the suspected influence of smoking on perinatal experience (*21–28*).

Study Design

The subjects and procedures have been fully described in an earlier report (*29*). Of the 269 nursing school graduates whose closely supervised training experience was analyzed for a combined total of 7,448 observation months, 55 (20.4 percent) smoked up to 9 cigarettes and 29 (10.8 percent) smoked 10 or more cigarettes per day. Because the latter group was too small to provide meaningful observations, the data on all 84 subjects who smoked were combined for comparison with observations on the 185 nonsmokers.

Classification into smoker and nonsmoker categories was based on the initial medical history. The retrospective nature of the study precluded delineation of any change in smoking habits during or subsequent to the remainder of the 3-year training period; some inappropriate classification doubtless occurred, notably in view of the evident tendency of some students to adopt or abandon the habit before graduation from nursing school (*12*). Similar, albeit less critical, limitations probably obtained concerning other information derived through recall. However, the principal variables studied, notably in respect to health status and selected body parameters, were directly, hence more reliably, determined. The routine hospitalization of all students absent from duty because of illness insured valid documentation of this probably most useful, single index of health status.

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Observations

The principal observations are summarized in tables 1–4. The overall morbidity pattern of the students who smoked was distinctly less favorable than that of the nonsmokers in the study sample (tables 1 and 2). Based on the proportions of students with greater than the median illness experience, statistically significant differences were noted for nonrespiratory ($P<0.05$) as well as respiratory ($P<0.0001$) conditions, in terms of both the number of absences and total absenteeism. The smokers also included a larger percentage ($P>0.05$) of students with above the median duration of absence for each illness (45.9 vs. 42.7 percent) and for each respiratory illness (54.3 vs. 44.3 percent), but not for each nonrespiratory illness (38.1 vs. 42.7 percent). Although this group was further characterized by a greater proportion of subjects with more than the median number of indispositions (visits to the health office for conditions not requiring hospitalization), the excess over the frequency among nonsmokers also was not statistically significant.

Table 1. Illness experience and related variables for smokers and nonsmokers [1]

Experience or attribute	Smokers	Nonsmokers	Difference probability
Absences:			
Number of infirmary admissions	69. 0	42. 2	<. 001
Days lost from duty	69. 0	40. 2	<. 001
Number for respiratory conditions	56. 0	34. 6	<. 001
Days for respiratory conditions	67. 9	36. 8	<. 001
Number for nonrespiratory conditions	48. 8	35. 1	<. 05
Days for nonrespiratory conditions	53. 6	37. 8	<. 05
Indispositions (health office visits)	57. 1	48. 6	>. 05
Estimated poor health:			
Pre-training	9. 5	15. 7	>. 05
Post training [2]	12. 3	3. 8	<. 05
Cornell Medical Index: high "complaint" score [3]	39. 2	51. 2	>. 05
Psychiatric evaluation "questionable"	39. 3	23. 8	<. 01
Stature	64. 3	45. 4	<. 01
Weight:			
Absolute	50. 0	50. 8	>. 05
Relative	45. 2	53. 0	>. 05
Loss during training	47. 5	31. 6	<. 05

[1] Frequency in percent above median (actual or approximated), except as otherwise indicated.
[2] 57 smokers and 132 nonsmokers.
[3] 74 smokers and 172 nonsmokers.

Estimated overall illness experience following graduation was significantly less favorable ($P<0.05$) for the smokers among the 190 nurses, 67.9 percent of the smokers and 71.4 percent of the nonsmokers, who provided this information (table 1). However, this group appeared to have had generally less illness before entering nursing school and also registered fewer complaints on the Cornell Medical Index at the time of admission.

The relative frequency of students whose mental health status was assessed as "questionable" or "doubtful" at the time of the routine (admission) psychiatric evaluation was significantly greater ($P<0.01$) among the smokers in the study group (table 1).

The proportion of smokers with above median stature was significantly greater ($P<0.01$) than that of the nonsmokers. The two groups were comparable in respect to absolute body weight. Among the 114 nurses who weighed between 111 and 130 pounds, a significantly greater percentage ($P<0.05$) of smokers were above median height, while among the 67 students in the modal stature group of 65 inches, the frequency of smoking varied inversely with body weight. Estimations of the Ponderal Index (height/$\sqrt[3]{\text{weight}}$) (*16*) and of the body surface area supported the observation that a greater proportion of smokers were below standard weight for height (table 1). Students who smoked also were represented to a significantly greater degree among those who lost weight than among those who gained weight during the training period (table 1).

The smokers included a greater proportion of students with hemoglobin levels below the median, as well as a higher percentage with substandard vision than the nonsmokers, but these observations were not statistically significant.

Parental age (at nurse's birth) tended to be above the median in the smoking group. Other relevant, although not statistically significant, observations among the smokers included a smaller proportion of physically active subjects and smaller proportions of students from the upper social class (based on father's occupa-

tion), from higher birth ranks, and of native-born parents. A greater proportion of smokers (57.0 percent) were born in the first half of the year, while relatively more nonsmokers (53.3 percent) were born during the second 6 months—a difference just short of significance at the 5 percent level.

Although the relative "risk" could not be estimated, a significantly greater proportion of married smokers ($P<0.05$) reported having no children at the time of followup (1963, 5–9 years after graduation); they also indicated a greater frequency of spontaneous abortion (0.51 per smoker vs. 0.45 per nonsmoker).

The mean birth weight of 84 children born to 37 smokers was lower than the average of 195 children of 98 nonsmokers, notably among the female infants (table 3). Differences between the birth weights of the offspring of the 37 smokers and the 98 nonsmokers generally persisted when comparisons were made between infants of nurses whose own birth weights were

Table 2. Comparative morbidity experience for smokers and nonsmokers among 269 student nurses

Condition	Days absent per student per year						Difference probability
	Mean number		Percent of total		Percent above median		
	Smokers	Nonsmokers	Smokers	Nonsmokers	Smokers	Nonsmokers	
All illnesses	6.67	4.87	100.0	100.0	69.0	40.2	<.001
Respiratory	3.45	2.23	51.5	45.9	67.9	36.8	<.001
Digestive [1]	.59	.46	8.7	9.5	39.3	36.2	
Injuries	.32	.14	4.8	2.9	22.6	12.4	<.05
Infections [2]	.20	.31	3.0	6.4	8.3	9.2	
Gynecological	.06	.16	.9	3.3	7.1	6.5	
Infectious mononucleosis	.49	.23	7.3	4.7	6.0	2.7	
Appendicitis	.21	.25	3.1	5.1	3.6	4.9	
Influenza	.20	.09	1.8	1.9	6.0	4.3	
Abdominal pain [3]	.09	.06	1.4	1.3	7.1	4.3	
Other [4]	1.17	.93	17.5	19.1	36.9	30.8	

[1] Excludes dental and oral conditions. [2] Excludes those in specific categories, principally of the skin. [3] Abdominal pain not included in other categories. [4] Includes tonsillectomies.

Table 3. Birth weights (in pounds) of infants of 37 smokers and 98 nonsmokers, by maternal birth weights

Infants of—	Infant birth weights															
	Maternal <7				Maternal 7–7.9				Maternal 8+				Total			
	Male		Female		Male		Female		Male		Female		Male		Female	
	<7	8+	<7	8+	<7	8+	<7	8+	<7	8+	<7	8+	<7	8+	<7	8+
Smokers: percent	50	9	61	16	33	13	43	14	36	36	57	29	40	18	54	20
Nonsmokers: percent	50	5	45	19	37	23	17	42	26	29	29	43	37	20	32	32
Smokers:																
Mean	7.17		6.94		7.15		6.96		7.58		7.14		7.28		7.01	
Number	12		18		15		14		11		14		38		46	
Nonsmokers:																
Mean	6.95		7.17		7.36		7.77		7.66		7.52		7.35		7.43	
Number	22		47		35		36		27		28		84		111	

of the same order (table 3). The recalled birth weights of 53 nurses who smoked also were lower on the average than those of 114 nonsmoking subjects (table 4).

Although the sex ratio of these children (44.3 percent males) differed significantly ($P<0.05$) from that of the general population, the ratio for the infants of smokers (45.4 percent males) was not appreciably different from that for the infants of nonsmokers (43.1 percent).

Table 4. Percent distribution of 53 smokers and 114 nonsmokers by birth weights (in pounds)

Subjects	Number	Mean	Percent distribution by birthweights		
			<7	7–7.9	8+
Smokers	53	7. 27	[1] 43. 4	26. 4	30. 2
Nonsmokers	114	7. 57	[2] 34. 2	30. 7	35. 1

[1] 4 (7.5 percent) weighed less than 5.5 pounds.
[2] 5 (4.4 percent) weighed less than 5.5 pounds.

Discussion

The comparatively greater morbidity experienced by the nursing students who smoked was consistent with expectations generated by the less favorable mortality rates associated with this practice (*1–8*). The greater frequency of respiratory conditions also was in accord with the excess of pulmonary problems, notably "chronic bronchitis," reported among smokers (*6, 8–11*).

Although some studies have failed to demonstrate an increased disposition to respiratory infections in persons who smoked (*30, 31*), Parnell and associates (*12*) recently reported a significantly greater frequency of these conditions in a matched sample of smokers from a Canadian student nurse population. They also noted a greater frequency, although with a slightly shorter mean duration, of nonrespiratory illness in this group—a finding which is supported by our observations and appears consistent with the increased illness noted by Rogers and Reese (*32*) among high school students who smoked.

The comparative youth of the subjects and the consequently few years during which they could have been smoking (*32–35*) argue against the likelihood of longstanding pathological processes attributable to tobacco consumption. In this instance relatively acute effects, common factors conducive to both the smoking habit and increased morbidity, or, possibly, a combination of these influences must be considered.

While much of the conflicting evidence concerning the physical characteristics of smokers (*13–17*) emphasizes the frequency of heavy somatotypes, at least one report indicates a preponderance of lean persons among regular smokers (*15*). Our study's support for the latter observation does not seem attributable to any greater similarity between these two populations in comparison with those sustaining the majority impression. The significantly greater prevalence of smokers among subjects who lost weight seems more in keeping with both expectation and experience (*36*).

The "questionable" emotional stability of a high proportion of students who smoked probably was the most predictable of the significant associations noted. Although based on single admission interviews, these psychiatric judgments were in keeping with substantial evidence for a relationship between personality characteristics and tobacco consumption (*18–20*). The significantly greater morbidity previously noted for these potentially less stable students (*29*) also seems consistent with their mental health assessments recorded when they entered nursing school.

The less favorable health patterns of smokers during the followup period, compared with the pretraining period, is essentially consonant with earlier observations (*29*).

The generally lower birth weights recorded for the children of the smoking group (as well as the greater frequency of abortion) are in agreement with other observations (*21–28*), some of which also appear to indicate relatively greater differences among female neonates. Although the generally lighter birth weights of the nurse subjects, notably of those who subsequently bore lighter infants, suggest a possible hereditary influence, the observations in groups with comparable birth weights indicate that other factors, such as smoking, are also likely to be operative.

The paucity and the recall origin of the birth

data obviously permit only tentative impressions, especially because the subjects were classified as either smokers or nonsmokers before marriage. Moreover, the data were derived from multiple infants of the nurse mothers, rather than from one child of each subject as in planned investigations of this relationship. However, questions concerning antecedent variables and inherent, constitutional factors generated by these "longitudinal" type data and by the reported occurrence of low birth weights among infants of women who had discontinued smoking (*24*) would appear to warrant studies designed to explore these specific possibilities.

The significantly low sex ratio observed in offspring of this study group, while possibly referable to chance variation, may reflect atypical attributes shared by nonsmokers as well as smokers in the student nurse sample.

Beyond the methodological limitations already noted, the unusual uniformity of the present study population must be emphasized. The preselected subjects were not only homogeneous in respect to sex, age, occupation, and living pattern, but, at graduation, necessarily varied less than new students entering nursing school. The consequent lack of close comparability with other, generally more heterogeneous, groups studied regarding smoking habits seems to underscore the significance of any similarities observed. The evidently increased disposition to a variety of illnesses among young, relatively new smokers, with an as yet low mortality risk, would seem to have important practical implications for programs designed to control conditions associated with smoking.

Summary

The illness experience of 84 nursing students who smoked was observed to be significantly less favorable than that of 185 nonsmoking peers. The excess morbidity incurred by the smoking group was noted in respect to nonrespiratory as well as respiratory conditions.

Smokers tended to be of greater stature and of relatively lighter weight than nonsmokers. They also included a greater proportion of students whose mental health status was identified as "questionable."

Infants subsequently born to the smokers weighed less at birth than those born to the nonsmokers. This difference was especially conspicuous among female infants and was evidenced even after adjustments for the generally lighter birth weights also recorded for the mothers who smoked.

Longitudinal studies are required to delineate the precise role of constitutional factors as well as the early and residual effects of smoking on health status.

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Nonsmokers Increase

More than 19 million adults have given up smoking in recent years as scientific evidence has accumulated showing cigarettes to be a serious health hazard. A current study by the Public Health Service suggests that a million adults each year manage successfully to give up smoking. The study's objective is to increase the ranks of ex-smokers. The U.S. Department of Agriculture, however, has announced that 541 billion cigarettes were smoked last year, an increase of 12.5 billion over 1965.

The continued increase in lung cancer deaths in the United States is almost wholly due to cigarette smoking. During the 4-month period, December 1966 through March 1967, a total of 18,000 Americans died of lung cancer according to the National Advisory Cancer Council.