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ADULT PASSIVE SMOKING IN THE HOME ENVIRONMENT: A RISK FACTOR FOR CHRONIC AIRFLOW LIMITATION

FRANCINE KAUFFMANN,[1] JEAN-FRANCOIS TESSIER[2] AND PAUL ORIOL[3]

Kauffmann, F. (INSERM U. 169, F-94807 Villejuif Cedex, France), J-F. Tessier and P. Oriol. Adult passive smoking in the home environment: a risk factor for chronic airflow limitation. *Am J Epidemiol* 1983;117:269-80.

Using the data of the French Cooperative Study PAARC (Pollution Atmosphérique et Affections Respiratoires Chroniques), which in 1975 surveyed more than 7800 adult residents of seven cities throughout France, the authors compared the spirometric measurements of two groups of nonsmokers: those with and without exposure to passive smoking in the home. They restricted the analysis to subjects aged 40 years of more (i.e., those presumably exposed for 15 years or more to smoking by their spouses) and who were living in households without other persons aged 18 years or older (to avoid potential misclassification as true nonsmokers of persons living with non-interviewed individuals). The authors found that nonsmoking subjects of either sex whose spouses were current smokers of at least 10 g of tobacco a day had significantly lower forced mid-expiratory flow rate (FEF_{25-75}) than those married to nonsmokers. This difference was not explained by social class, educational level, air pollution, or family size. Women, among whom passive smoking is much more prevalent than it is among men, also showed a significant difference in forced expiratory volume in one second (FEV_1), and a clear dose-effect relationship to amount of smoking by their husbands was found in the large subgroup of women without paid work (i.e., those not exposed to workplace smoking).

airway obstruction; educational status; epidemiologic methods; smoking; social class; spirometry

Active smoking is well recognized as a risk factor for chronic airflow limitation (1). The role of passive smoking has not yet been finally defined. One study (2) recently demonstrated the deleterious effec for nonsmokers of working in a smoky environment for 20 years, whereas tw studies (3, 4) did not show a significan

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Abbreviations: BMRC, British Medical Research Council; ECSC, European Coal and Steel Community; FEF_{25-75}, forced mid-expiratory flow between 25 and 75 per cent of vital capacity; FEV_1, forced expiratory volume in one second; FVC, forced vital capacity; PAARC, Pollution Atmosphérique et Affections Respiratoires Chroniques.

[1] Unité de Recherches sur les Méthodes Statistiques et Epidemiologiques et leurs Applications à l'Etude des Maladies Chroniques, INSERM U. 169, Villejuif, France.

[2] INSERM, Laboratoire de Santé Publique, Faculté de Medecine, Bordeaux, France.

[3] Centre Hospitalier, Versailles, France.

Send requests for reprints to Francine Kauffmann, INSERM U. 169 16 Bis, av. P. V. Couturier F-94807 Villejuif Cedex, France.

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decrease in forced expiratory volume with household exposure to tobacco smoke in adults, though a trend was found in one study (4).

We present here a detailed analysis of lung function indices among adults according to passive smoking in the home. Confounding factors and dose-effect relationships are considered.

Materials and methods

The detailed protocol of the French Cooperative Study PAARC (Pollution Atmosphérique et Affections Respiratoires Chroniques) realized in 1975 has been published elsewhere (5). The primary purpose of the study was to look at the possible role of air pollution on respiratory symptoms and ventilatory function. The effect was hypothesized as small and therefore, the design of the study took into account various confounding variables and included a large number of subjects. This provides a good opportunity to look at the possible role of passive smoking. Briefly, the adult subjects for this study were 23,715 residents of 24 areas in seven cities throughout France (Bordeaux, Lille, Lyons, Mantes-la-Jolie, Marseilles, Rouen, and Toulouse). These subjects, all 25–59 years of age, were members of households selected by a preliminary survey, and were all French, non-manual employed "heads" of household (to avoid subjects with important occupational exposure), and resident in the area for at least three years (to have a known exposure to air pollution for a minimal duration). In the main survey, 6 per cent of the subjects selected refused and 7 per cent were not seen for other reasons. The remaining 87 per cent were interviewed at home with a questionnaire derived from the British Medical Research Council/European Coal and Steel Community questionnaire (BMRC/ECSC) (5, 6). Respiratory symptoms, past and present personal smoking habits, occupational exposure, occupation, social class, educational level, composition of the household, and housing conditions were recorded.

Spirometric measurements with a dry expirograph (Vitalograph) were obtained for 95 per cent of the interviewed. At least three tracings were performed following ECSC recommendations (7). The maximum values of forced vital capacity (FVC), and of forced expiratory volume in one second (FEV_1) expressed in ambient temperature and pressure saturated conditions were used in analysis. Forced mid-expiratory flow between 25 and 75 per cent of the vital capacity (FEF_{25-75}) was calculated on the tracing with the maximum FEV_1. Good tracings were defined by standard criteria. Although a pilot study had previously been undertaken on 3000 individuals (5), there remained some discrepancies in the data between towns in the main study, in particular, the percentage of poor tracings and regression coefficients on age were significantly different between towns. Because of this, to avoid possible bias, we considered in the analysis town-adjusted spirometric variables. For the 6707 men and 8267 women with good tracings, we calculated the regressions of FVC, FEV_1 and FEF_{25-75} on age and height for each sex and town and then adjusted normalized spirometric variables for age, height, sex, and town. Normalized value of FVC for a given sex of a subject living in town i = (observed FVC − $(a_i$ Age + b_i Height + c_i)) $\backslash \sqrt{s_i^2}$, where a_i and b_i are the regression coefficients on age and height, c_i the intercept and s_i^2 the residual variance for town i. Because the main analysis is restricted to subjects 40 years of age or more, for a reason to become apparent, we then used regressions restricted to people of this age group for a better adjustment, though using the general regression would not change the figures much. In the presentation, the normalized values were converted to those for subjects of mean age and height.

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$$\text{Adjusted FVC} = \overline{\text{FVC}} + \text{normalized FVC} \times \sqrt{\frac{\sum_i (n_i - 1)s_i^2}{\sum_i (n_i - 1)}}$$

where n_i is the number of subjects available for regression in town i and $\overline{\text{FVC}}$ the mean among all subjects of the same sex.

Current smokers were divided into heavy smokers (20 g or more of tobacco a day, as cigarettes, cigars, or pipe), moderate smokers (10–19 g a day) and light smokers (up to 9 g a day). Ex-smokers were those who had stopped for at least one month. The usual nonsmokers were divided into "true" nonsmokers, defined as those living in households with no smoker or ex-smoker interviewed, and passive smokers, those living with at least one smoker or ex-smoker. In the present analysis, we considered mainly those living with a current smoker of 10 g a day or more. Unless otherwise specified, it is this group which is called passive smokers. Occasionally, light passive smokers, i.e., nonsmokers living with a current smoker of 1–9 g a day are considered. Those living with an ex-smoker are excluded from the analysis of passive smoking.

We restricted the analysis to the homogeneous group of 5266 households with two spouses interviewed and living with no other person aged 18 years or more to avoid potential misclassification as true nonsmokers of persons previously living with a smoking spouse or living with a son or daughter aged 18–24 years not interviewed or living with a spouse 60 years or older not interviewed. The active and passive smoking of the 7818 household members who performed good spirometric tracings are presented in table 1. Men were 2.6 times more often active smokers than women and among nonsmokers in the usual sense (i.e., nonactive smokers), women were 5.2 times as likely to live with a spouse who was a current smoker than men were.

Based on their most recent occupation, subjects were classified according to French sociooccupational classes defined by the Institut National de la Statistique et des Etudes Economiques. Classes III, IV, II, V, VI, VII, IX were represented in the study and this order corresponds

TABLE 1

*Active and passive smoking among adult residents of seven cities throughout France, surveyed in the French Cooperative Study PAARC**

	Men	Women
Total	3915	3903
Ever-smokers (active)		
Smokers ≥20 g/day	1103	189
Smokers 10–19 g/day	656	254
Smokers 1–9 g/day	466	406
Ex-smokers	636	252
Passive smokers		
Living with a smoker ≥20 g/day †	27	710
Living with a smoker 10–19 g/day †	38	445
Living with a smoker 1–9 g/day ‡	66	322
Living with an ex-smoker	44	461
True nonsmokers	849	826
Smoking habits unknown	38	35

* Pollution Atmospherique et Affections Respiratoires Chroniques.
† Referred to later as passive smokers.
‡ Referred to later as light passive smokers.

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roughly to British social classes I; II; III; III; III, IV or V; III or IV; undefined. More precisely, they represent the following occupations (in parentheses are given the percentages observed for men and women, respectively): III (27 and 8 per cent), managers, administrators, professionals; IV (31 and 16 per cent), intermediate—teachers, technicians, nurses, administrators; II (16 and 8 per cent), self-employed—shopkeepers, craftsmen; V (22 and 29 per cent), employees—clerks, salespersons; VI (0.4 and 8 per cent), manual workers, employed; VII (3 and 5 per cent), personal service workers; IX (0.2 and 26 per cent), never employed. Subjects were classified in three groups by educational level: persons having completed the primary level (45 per cent of men and 52 per cent of women), secondary level (30 and 35 per cent) and university degree (25 and 13 per cent).

Using the means of daily measurements over a three-year period of SO_2 (acidimetric method), which was the only pollutant measured that was found to be related to ventilatory function (8), subjects were classified as living in areas of low pollution (SO_2 <50 $\mu g/m^3$), moderate pollution (50 $\mu g/m^3 \leq SO_2 <$ 100 $\mu g/m^3$) and heavy pollution ($SO_2 \geq$ 100 $\mu g/m^3$).

Chi-square tests and analysis of variance with calculations of adjusted percentages (Cochran's method) and adjusted means (analysis of variance and multiple regression) were used (9, 10).

Results

Comparing true nonsmokers and passive smokers in the whole sample, FEV_1 and FEF_{25-75} showed opposite trends in men, and indicated that women had slightly lower values of FVC, FEV_1 and FEF_{25-75} for passive smokers than true nonsmokers, but the differences were not significant (table 2). Going back to crude FEF_{25-75} values according to age for women, it appears that a difference between true nonsmokers and passive smokers began around age 40 years (figure 1). This is not surprising because the younger subjects have presumably been exposed for a relatively short time. Restricting the comparison to subjects aged 40 years or more, i.e., presumably exposed for 15 years or more (table 3), the difference in FEF_{25-75} became significant for both men and women. FEV_1 was significantly lower only for women passive smokers, but for men, a trend in the same direction was observed. From these results, it appears that living for at least 15 years with a current smoker of 10 g/day or more was associated with a lower FEF_{25-75} and to a lesser extent with a lower FEV_1.

We then looked to see if these differences might be explained by confounding

Table 2

FVC, FEV_1, and FEF_{25-75} (mean ± SD) according to passive smoking among adult residents of seven cities throughout France, surveyed in the French Cooperative Study PAARC

	Men			Women		
	True nonsmokers	Passive smokers	*p* value	True nonsmokers	Passive smokers	*p* value
No.	849	65	–	826	1168	–
FVC* (liters)	4.32 ± 0.63	4.45 ± 0.57	NS†	3.12 ± 0.47	3.09 ± 0.45	NS
FEV_1* (liters)	3.65 ± 0.60	3.63 ± 0.60	NS	2.56 ± 0.46	2.53 ± 0.44	NS
FEV_{25-75}* (liters/second)	3.91 ± 1.24	3.77 ± 1.13	NS	2.89 ± 0.99	2.85 ± 0.95	NS

* Adjusted for age, height, town presented for a mean subject (male, 42.0 years, 1.723 m; female, 42.0 years, 1.613 m).

† NS, nonsignificant $p > 0.10$.

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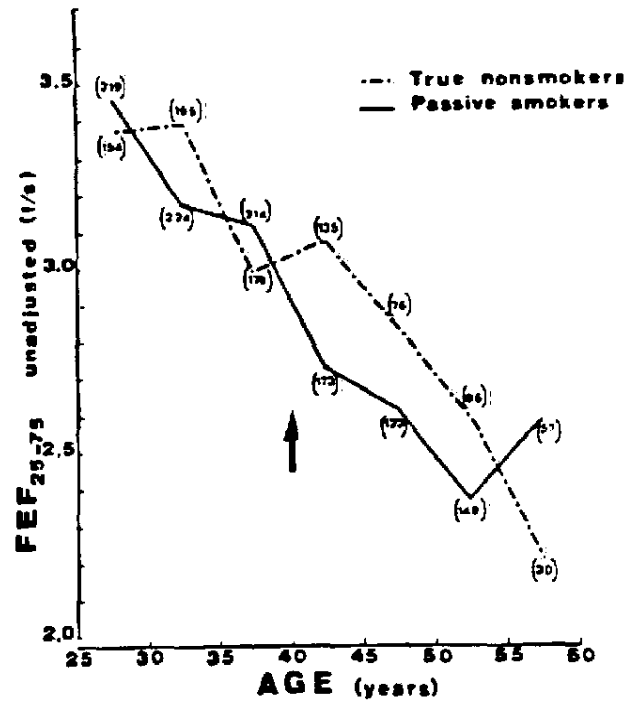

FIGURE 1. FEF$_{25-75}$ according to passive smoking and age among 1985 women, French Cooperative Study PAARC. Number of women shown in parentheses. Significant differences were observed for only two age groups, 30–35 years (p = 0.04) and 40–45 years (p = 0.004).

factors, in particular sociocultural data recorded in the study (social class and educational level). These variables appeared of interest because they were related both to smoking and to spirometric variables. To look at what determined the exposure to passive smoking, we investigated active smoking determinants. Active smoking was lower for men with a university degree (table 4) whereas among better educated women it increased. As expected, assortative marriage for educational level and social class was very highly significant (χ^2 4 d.f. for education level = 741). However, very highly significant resemblance in smoking habits between spouses was observed, though the association was lower than for educational level. For example, the proportion of women active smokers according to their husbands' smoking habits was 10 per cent for nonsmokers, 16 per cent for ex-smokers and 24 per cent for current smokers. The high significance of this resemblance persisted after adjustment for the various sociocultural variables.

On the whole, passive smoking appeared to be related to the sociocultural variables. For instance, the educational level of the man of the house, which gives a good description of the influence of cultural habits of both members of the household, was positively associated with passive smoking among men, but negatively associated with passive smoking among women (table 4).

On the other hand, FVC, FEV$_1$, and FEF$_{25-75}$ were significantly higher in the

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TABLE 3

FVC, FEV_1, and FEF_{25-75} (mean ± SD) according to passive smoking among adult residents, aged 40 years or more, of seven cities throughout France, surveyed in the French Cooperative Study PAARC

	Men			Women		
	True nonsmokers	Passive smokers	p value	True nonsmokers	Passive smokers	p value
No.	423	29	–	327	501	–
FVC* (liters)	4.08 ± 0.63	4.11 ± 0.56	NS†	2.98 ± 0.46	2.89 ± 0.48	0.013
FEV_1*	3.31 ± 0.58	3.19 ± 0.60	NS	2.43 ± 0.45	2.34 ± 0.45	0.007
FEF_{25-75}* (liters/second)	3.58 ± 1.17	3.02 ± 0.84	0.012	2.74 ± 0.99	2.57 ± 0.87	0.010

* Adjusted for age, height, town, presented for a mean subject (male, 48.9 years, 1.714 m; female, 48.6 years, 1.608 m).

† NS, nonsignificant $p > 0.10$.

TABLE 4

Active and passive smoking according to the educational level of the man of the house among adult residents, aged 40 years or more, of seven cities throughout France, surveyed in the French Cooperative Study PAARC

	Educational level of the man of the house			
	Primary	Secondary	University	p value
Active smoking				
Men				
No.	1227	658	428	–
Nonsmokers (%)	25.4	23.5	25.5	
Ex-smokers (%)	19.2	22.5	27.3	0.005
Current smokers (%)	55.4	54.0	47.2	
Women				
No.	1225	652	428	–
Nonsmokers (%)	80.3	73.2	66.6	
Ex-smokers (%)	3.5	7.2	7.7	$<10^{-3}$
Current smokers (%)	16.2	19.6	25.7	
Passive smoking				
Men				
No.*	253	120	79	–
Passive smokers (%)	4.4	7.5	11.4	0.07
Women				
No.*	486	223	119	–
Passive smokers (%)	63.8	59.6	48.7	0.01

* True nonsmokers + passive smokers.

upper class and the highest educational level for men and women, considering the characteristics of either husbands or wives. These differences were partly due to active smoking.

The relationships between the sociocultural variables and passive smoking on the one hand and the spirometric variables on the other decreased the association between passive smoking and FEF_{25-75} in men. By contrast, in women, the sociocultural variables could partially explain the relationship between passive smoking and spirometric measurements. Adjusted for these variables, the differences in FEF_{25-75} were significant for men

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and, though slightly decreased, the differences for women remained significant for FEV_1 and FEF_{25-75}. FEF_{25-75} according to passive smoking and social class of the subjects are presented in figures 2 and 3. Note that for women the classes with reversed trend (value higher for passive smokers than for true nonsmokers) included the highest percentages of women with paid work and therefore with a true nonsmoker subgroup possibly more frequently exposed to occupational passive smoking.

The FEF_{25-75} values of nonsmokers, passive (including light) smokers, ex-smokers and active smokers are shown in figure 4. Among women, the light passive smokers appeared in an intermediate position between true nonsmokers and passive smokers. Women living with heavy smokers appeared to have the same values as light or moderate smokers. Among men, an unexpected pattern appeared: light passive smokers had the highest FEF_{25-75} and passive smokers had lower values than active smokers. Though these findings could be due to the small number of men involved, the latter finding might also be explained by some selective factors, in so far as to be a male passive

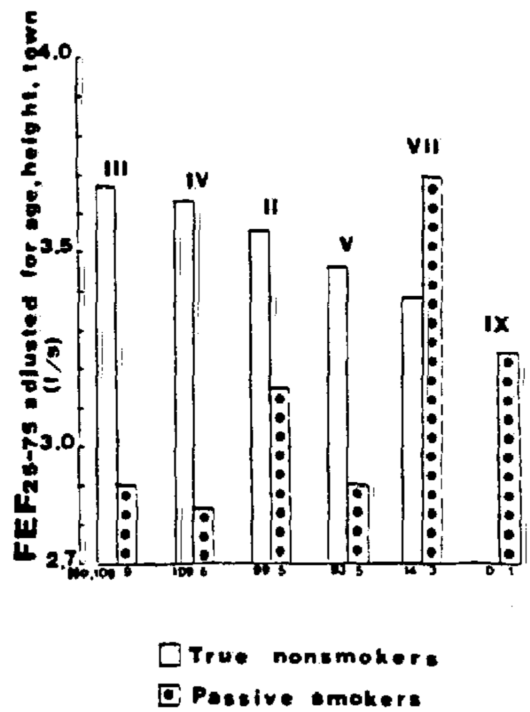

FIGURE 2. FEF_{25-75} among men aged 40+ years according to their passive smoking and social class. French Cooperative Study PAARC. The social classes were: professional (III), intermediate (IV), self-employed (II), employees (V), personal service (VII), and never employed (IX). No significant difference was observed at the 5 per cent level in any social class considered separately. At the 10 per cent level, social classes III and IV show differences. Adjusted for social class, the difference between true nonsmokers and passive smokers was significant at the 1 per cent level.

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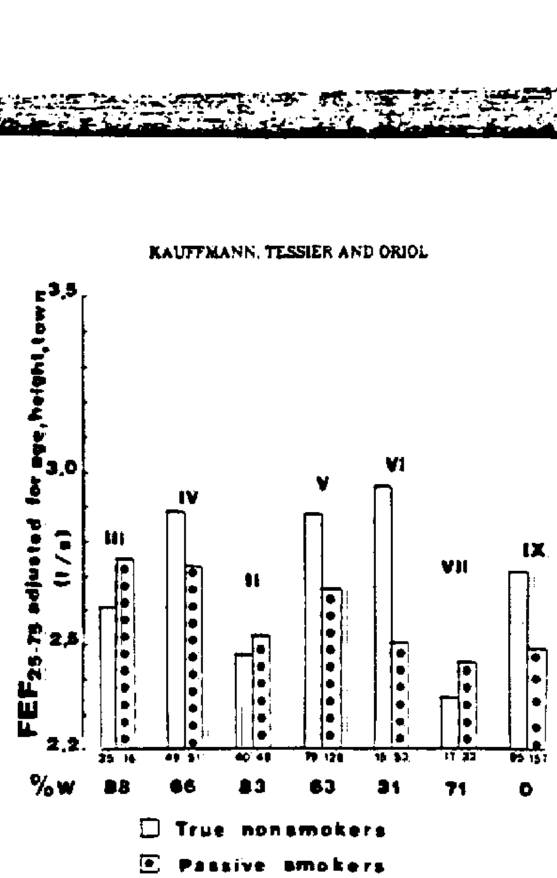

FIGURE 3. FEF_{25-75} among women aged 40+ years according to their passive smoking and social class. French Cooperative Study PAARC. "% w" represents the percentage of women with paid work at the time of the study. The social classes were: professional (III), intermediate (IV), self employed (II), employees (V), manual workers (VI), personal service (VII), and never employed (IX). No significant difference was observed at the 5 per cent level in any social class considered separately. At the 10 per cent level, social classes V, VI, and IX show differences. Adjusted for social class, the difference between true nonsmokers and passive smokers was significant at the 2 per cent level.

smoker was a rather unusual situation and this "abnormal" way of living could be related to selective factors. As a matter of fact, a higher percentage of passive smokers than true nonsmokers reported a history of asthma (17.2 vs. 7.8 per cent; p = 0.07) which might discourage smoking though the individuals were married to a smoker (the percentages were 4.6 for light passive smokers, 7.1 for ex-smokers, and 6.9 for active current smokers). Excluding these asthmatic subjects, the pattern observed for men was less striking but persisted, and the difference between true nonsmokers and passive smokers was of borderline significance (p = 0.07). Exclusion of those with a history of asthma did not modify the results among women.

Passive smoking was not related to month of examination. Borderline significant associations were observed between female passive smoking and air pollution (p = 0.08) and the number of people living in the household (p = 0.06). However, these relationships showed no confounding trend: passive smokers made up 62 per cent in areas of low pollution, 55 per cent in areas of moderate pollution, and 65 per cent in heavily polluted areas. In households with 2, 3, 4, 5, and 6+ members, passive smoking was observed in 65, 57, 61, 46, and 63 per cent, respectively. As expected with such figures, adjustment on air pollution or number of people in the household did not change the differences observed between true nonsmokers and passive smokers.

The size of the group of female passive

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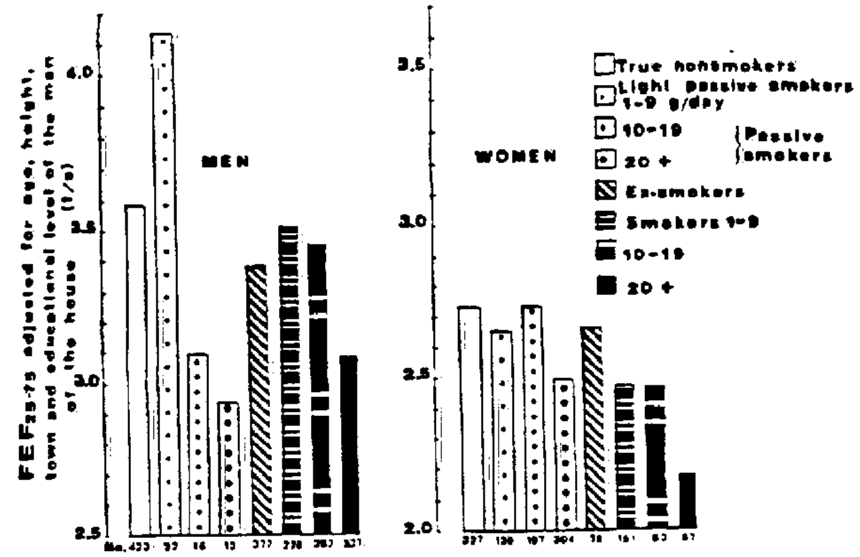

FIGURE 4. FEF_{25-75} among men and women according to active and passive smoking. French Cooperative Study PAARC. For men and women, differences in FEF_{25-75} between the eight groups were significant at the 0.001 level.

smokers allowed more detailed comparisons. In the more homogeneous group of women without paid work at the time of the study, women who were presumably less exposed to passive smoking in closed areas such as offices than the working women, a dose-effect relationship according to the amount of tobacco smoked by their husbands was evident, as shown in table 5. The difference in FEF_{25-75} remained statistically significant after adjustment for the sociocultural variables. The density of smokers/room gives another quantification of the dose. Therefore, we looked at FEF_{25-75} values according to the number of rooms. This gave the same information, however, because our passive smokers lived in households that included just one smoker. No clear conclusion arose from this approach.

DISCUSSION

The comparisons of "true" nonsmokers (persons without household exposure to tobacco smoke) to individuals with an exposure to passive smoking consisting of living for at least 15 years with a current smoker of 10 g or more a day enable us to show a significant decrease of FEF_{25-75} with passive smoking among both men and women, which does not seem to be explained by confounding factors. A clear dose-effect relationship was shown among the women without paid work according to exposure to passive smoking. These results confirm partial data previously published on the same population (11, 12) as well as the conclusions of White and Froeb's study (2) on the noxious role of passive smoking in the work environment.

Data on gas cooking were not collected in the PAARC study. It seems nevertheless that the differences observed between true nonsmokers and passive smokers could not be due to differences in gas cooking in so far as we observed the difference for both sexes.

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TABLE 5

FVC, FEV_1, and FEF_{25-75} (mean ± SD) according to different exposures to passive smoking among women residents, aged 40 years or more without paid work, of seven cities throughout France, surveyed in the French Cooperative Study PAARC

	Husband current smoker (g/day)				
	0	1–9	10–19	≥20	p value
No.	177	71	115	172	–
FVC* (liters)	2.97 ± 0.50	2.95 ± 0.56	2.94 ± 0.45	2.88 ± 0.46	NS†
FEV_1* (liters)	2.43 ± 0.49	2.39 ± 0.61	2.39 ± 0.40	2.31 ± 0.45	NS
FEF_{25-75}* (liters/second)	2.76 ± 1.01	2.74 ± 1.01	2.64 ± 0.91	2.47 ± 0.84	0.025

* Adjusted for age, height, town, presented for a mean woman 48.6 years, 1.608 m.

† NS, nonsignificant $p > 0.10$.

The two other published studies on the same topic, by Shilling et al. (3) and Comstock et al. (4), did not show significant decreases in lung function indices related to household exposure to tobacco smoke. There could be several reasons for these negative findings. The populations studied were more heterogeneous than that in the PAARC study, which excluded households "headed" by manual workers. Occupational exposure is probably a more important factor than passive smoking at home. In Shilling et al. (3), there was no assessment made of possible active smoking of other people living in the household. Their study included parents who had children who were aged only seven years, i.e., they were usually young parents. The study by Comstock et al. (4) included subjects starting at age 20 years. We found no significant difference when considering the whole PAARC population including young subjects. A certain duration of exposure was necessary to detect the effect with the indices we used. In the PAARC study, FEF_{25-75} appeared to be a more sensitive test than FEV_1. The two other studies considered only FEV_1, or, in Comstock et al., a qualitative variable derived from it, which allowed even less powerful statistical tests than the crude values. All these factors may explain the fact that no difference was found by Shilling et al. and only a trend by Comstock et al., but the most important is probably difference in age in so far as we found among the important group of women a significant difference in FEV_1.

Because of the very small number of studies on the effects on spirometric variables of passive smoking in the home environment, it is of interest to consider the studies on passive smoking and lung cancer. Whereas studies in Japan (13) and Greece (14) show a significant increase of lung cancer among nonsmoking women married to smokers, a study in the United States (15) did not find passive smoking to be a risk factor for lung cancer. Housing conditions are better in the US than in Japan and Greece and this can be hypothesized as an explanation for the observed results. Likewise, in France, housing conditions are not as good as in the US, particularly regarding the density of persons per room (0.5 in Comstock et al. (4) and 0.9 in the PAARC study). On theoretic and experimental grounds (16), and as demonstrated in the White and Froeb study (2) on passive smoking at work, the inefficacy of the usual conditions of ventilation to extract air polluted by smoking has been stressed. The Japanese and Greek studies were restricted to subjects aged 40 years or more, and the study by White and Froeb to subjects with 20 years' exposure. We did not find clear differences with the lung function indices we used before 40 years of age, i.e., in persons who probably had an ex-

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e smoking among women
France, surveyed in the

≥20	p value
172	–
9 = 0.46	NS
1 = 0.45	NS
7 = 0.84	0.025

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posure of 15 years. Therefore, no conclusion can be drawn for shorter exposures.

Larger differences in FEF$_{25-75}$ between nonsmokers and passive smokers were observed by White and Froeb (2) than in the PAARC study. It seems that this could be related to differences in the population studied and to the type of exposure to involuntary smoking considered: the subjects they studied were selected (all working, no persistent cough, no asthma, etc.). Moreover, the occupational exposure to tobacco smoke considered was more intense than in households with one current smoker.

The comparison between the nonsmokers and the passive smokers was considered by White and Froeb as "truly experimental". This could be possible for occupational exposure; for household exposure, only women could be so described because male passive smokers were so uncommon, at least in these age groups in France, that they might be selected. The higher percentage of asthmatics among male passive smokers supports this hypothesis.

Concerning the epidemiology of smoking, our study gives data about spouses' resemblance in smoking habits. Assortative marriage for smoking habits has already been clearly shown in Scotland by Sutton (17), independently of social class and education. Because smoking habits are strongly culture-related, it is difficult to extrapolate such data to other countries. In Shilling et al. (3), 35 per cent of women and 22 per cent of men were passive smokers, while in Comstock et al. (4), 31 per cent of women and 21 per cent of men were. In our study, considering all subjects aged 25–59 years independently of the amount passively smoked as in the other studies, 47 per cent of the women and 15 per cent of the men were passive smokers (passive (including light) smokers/passive + true nonsmokers). Of women aged 40 years or more, 66 per cent were passive smokers (11 per cent for men), but 76 per cent for Japanese women (13). Because of the large size of the female passive smoking group, as Hirayama (13) pointed out in terms of attributable risk for lung cancer, the effect of passive smoking on chronic airflow limitation might be more important in some countries than that of direct smoking among women aged 40 years or more. Our population, which showed percentages midway between the data reported in the US and Japan, could be considered as representative of the same age groups belonging to households not "headed" by a manual worker in urban areas in France. Six of the seven cities had populations of more than 300,000 and a university and the seventh had 70,000 inhabitants.

Smoking, active (because of assortative marriage for smoking) as well as passive, because of its noxious effect shown here, partly explains resemblance in spirometric measurements between spouses, which have been observed by Higgins et al. (18) as well as in the PAARC population (19).

It has been said that lung function differences between female nonsmokers and smokers is lower than among males (20, 21). Besides the observation of higher social class for female smokers and lower class for male smokers, the fact that women nonsmokers are much more often exposed to the deleterious effect of passive smoking at home could, at least partly, explain such a difference, which has not been found by other authors (22, 23). In the present study, the absolute difference in FEF$_{25-75}$ between true nonsmokers and smokers was higher for females than for males, even though the mean level was lower, which might better support the opposite conclusions.

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