RESEARCH PAPER

Smoking in immigrants: do socioeconomic gradients follow the pattern expected from the tobacco epidemic?

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Objectives: Although socioeconomic patterns of smoking across the different stages of the tobacco epidemic have been well researched, less is known about these patterns among immigrant populations. This paper aims to assess the smoking prevalence and its socioeconomic gradients among three immigrant populations.

Methods: Three cross-sectional studies, using structured face-to-face interviews, were conducted in three representative (for socioeconomic status) samples of 385 Turkish, 316 Moroccan, and 1072 Surinamese first-generation immigrants aged 35–60 years in Amsterdam, the Netherlands. Information gathered included information about smoking behaviour, educational level and background characteristics. The associations between educational level and smoking rates were assessed using logistic regression analyses stratified by age and sex, for each ethnic group separately.

Results: The prevalence of smoking differed per group, being highest among Turkish and Surinamese men (63% and 55%, respectively), followed by Moroccan men and Turkish and Surinamese women (30%, 32% and 27%, respectively). Higher smoking rates were found among women with higher educational levels, except for Surinamese women aged 35–44 years. However, among Turkish and Moroccan men aged 35–44 years and Surinamese men, smoking rates were higher in lower socioeconomic groups.

Conclusions: The prevalence figures and educational associations suggest that the socioeconomic gradient changes in earlier stages of the epidemic in immigrant populations than in the Western host populations, particularly in men. This provides indications to suggest that smoking prevention measures in male immigrant groups need to be tailored to lower socioeconomic groups in particular throughout the tobacco epidemic, and to higher socioeconomic groups among women.

As a result of immigration, Western European countries are becoming increasingly ethnically diverse. For instance, in the Netherlands approximately 10% and in the United Kingdom approximately 8% of the population is of non-Western origin.[1 2] Although the health behaviour of immigrant populations in some respects seems to be better than that of the host population, there are indications that smoking prevalence is relatively high in some immigrant groups.[3–5] As tobacco smoking is one of the major preventable causes of morbidity and mortality,[6] it is a major public health concern for immigrant populations.

The diffusion of smoking through populations across the world can be described as going through several separate stages known as the ''tobacco epidemic''.[7] Smoking increases rapidly from less than 15% among men in the first stage to a peak of 50–80% among men in the second stage. In these stages female prevalence lags behind that of men by one or two decades, but is increasing rapidly in the second stage. From the third stage onwards, a decline in smoking prevalence occurs among men to 40% by the end of this stage and also female smoking starts to decline at the end of this stage, reaching a maximum of 35–40%. The fourth stage is characterised by a slow decline in smoking prevalence for both sexes. In this phase an increasing number of prevention programmes can be observed.

Currently, high income Northern European countries are in stage 4 of the tobacco epidemic.[8 9] With the increasing migration from non-Western countries, Northern European countries, including the Netherlands, are faced with a growing population from countries that are in earlier stages of the tobacco epidemic than the host population.[7] Available figures on smoking rates among these immigrant populations in the Netherlands[4] and those from their countries of origin,[10] together with available smoking related mortality rates,[11 12] suggest that immigrants can be broadly placed in the similar stage as their country of origin is located. Smoking rates among Turkish and Surinamese immigrants, for example, are similar to stage 2 (up to 70% and 40–51% of the Turkish and Surinamese men smoke, and 21–34% and 17–22% among Turkish and Surinamese women, respectively), whereas the absence of Moroccan female smokers and the moderate prevalence among Moroccan men (approximately 30% smoke), suggest that they are at the start of the epidemic.

During the stages of the tobacco epidemic, socioeconomic gradients appear to change as well. This can be understood from the diffusion of innovations theory.[13] Uptake of smoking (stage 1) is initially highest among people in higher socioeconomic positions, who are thought to adopt innovations and new behaviours more quickly than less advantaged groups. As the behaviour diffuses throughout the population, the socioeconomic gradient diminishes (stage 2), due to increased prevalence among less affluent socioeconomic groups. In stage 3, the prevalence of smoking declines among higher socioeconomic groups, but remains high among those with lower socioeconomic status, resulting in reversed socioeconomic gradient in smoking in stage 4.[8 9 14] For example, in the Netherlands (a stage 4 country), smoking rates varied from approximately 49% and 31% among lower educated men and women, respectively, to 31% and 23% among higher educated men and women.[15]

Information about socioeconomic patterns in smoking among immigrants is scarce. There are reasons to assume that this socioeconomic pattern in relation to the stage in the tobacco epidemic differs from that in the host population. Firstly, immigrant populations are exposed to tobacco control programmes, including anti-smoking campaigns and bans on

tobacco advertising, and reversed smoking patterns in the host population while at the same time being in the earlier stages of the tobacco epidemic. This might lead to a relatively modest increase of smoking or even a decrease of smoking among people with a higher education in particular, as they will notice the anti-smoking messages most and are confronted with low prevalences of smoking in their Dutch peers. Secondly, due to migration to a society where smoking is more common among people with a lower socioeconomic position, immigrants with lower levels of education are more likely to be exposed to a high smoking prevalence. This might result in a relatively fast increase in smoking prevalence among the lower educated immigrants. Consequently, we hypothesise that the socioeconomic gradients will reverse in earlier stages among immigrant populations—that is, higher smoking prevalences will be found among the lower educated in earlier stages than is known from the populations in current stage 4 host countries (as described by Lopez *et al*[7]).

By determining the socioeconomic gradients among immigrant populations we will gain more insight into how smoking evolves in these populations and how the smoking patterns relate to the known smoking patterns in Western populations. This information might provide insight into future smoking patterns among immigrant populations. This paper aims to test the hypothesis mentioned before by assessing the smoking prevalence and its socioeconomic gradients among three immigrant populations.

DATA AND METHODS

Surinamese study population

Data on the Surinamese population were obtained from the SUNSET study (Surinamese in the Netherlands: Study on Ethnicity And Health), a study approved by the Institutional Review Board of the Academic Medical Center (AMC). SUNSET is a cross-sectional study that aims to assess the cardiovascular risk profile of the Surinamese immigrant population in the Netherlands. It is based on a random sample of 2000 non-institutionalised persons aged 35–60 years in South East Amsterdam, the Netherlands. They were selected from the Amsterdam population register and classified as Surinamese if they were born in Surinam and one of their parents were born in Surinam, or if both their parents were born in Surinam. Persons were classified as non-responders if they could not be contacted after three attempts or refused to participate. The response rate was 60% (n = 1072 interviews). We observed a significant difference in the response rate for men and women (49.8% and 63.5%, respectively; $\chi^2 = 52.27$, $p < 0.001$). Furthermore, responders were slightly more likely to be married, living with a partner and/or children, and have a higher income.

Turkish and Moroccan study population

Data on the Turkish and Moroccan population were collected as part of the general health questionnaire, carried out by the Municipal Health Organization Amsterdam and approved by the Institutional Review Board of the AMC. For this investigation, a sample of non-institutionalised people aged 35–54 years was selected from the municipal population register, stratified by 10-year age groups. Turkish and Moroccan persons were defined as people born in Turkey or Morocco and one of their parents were born in Turkey or Morocco or if both their parents were born in Turkey or Morocco. Persons were classified as non-responders if they could not be contacted after five attempts or refused to participate. The response rate among the Turkish population was 42.3% (385 interviews); 49.4% appeared to be approached fewer than the required five attempts (due to misunderstandings among the interviewers about the procedures), implying that they were not necessarily non-responders. Furthermore, 6.4% were classified as ''real'' non-responders and 1.9% interviews were invalid. Among the Moroccans the response rate was 42.2% (316 interviews), 39.5% were approached fewer than the required number of attempts, 15.9% were classified as ''real'' non-responders and 2.4% of the interviews were invalid.

Data collection

The data from the Surinamese population were collected in 2001–2003. Data from the Turkish and Moroccan population were collected in 2000. People in the three samples were approached for a face-to-face interview. They received a letter informing them about the aim of the study and the procedure. The interviewers—who were matched by ethnicity and sex to the respondents—approached them at home. Respondents were assured their answers were confidential and the analyses were anonymous. The interview consisted of structured questions with response cards and lasted approximately one hour. For the Turkish and Moroccan sample, the questionnaire was translated into Turkish and Moroccan. The forward and back translations were performed by certified translators and discussed with the researchers in order to ensure that the meaning of the questions did not change.

Measures

Smoking behaviour was measured by eight questions about the current and former smoking behaviour. Respondents were classified as smokers, ex-smokers and never smokers according to World Health Organization standards.[16] Daily smokers and occasional smokers were included in the analyses.

Educational level was indicated by the highest education attained. Five categories were used, from no education to higher vocational training or university. For reasons of statistical power we aggregated some categories in the single samples, resulting in three categories among the Turkish and Moroccan immigrants (no education, primary education, and at least low vocational training) and four categories among the Surinamese immigrants (none or primary education, lower or general vocational education, intermediate or higher general education or intermediate vocational training, and higher vocational training or university) (see table 1 for the distribution per sample across the five categories).

We also measured other characteristics of the population. *Religion* was measured by asking which religion respondents belonged to. *Acculturation* was assessed by several indicators in the main study. For this study we used the indicator social contacts with the host population, which is one of the components in the process of acculturation according to Berry.[17] We believed that this indicator would most fit in our hypotheses. We used the question ''In leisure time, do you have contact with ethnic Dutch people?'' (no contact, moderate contact and frequently contact with ethnic Dutch people).[18] *Year of migration* was measured by the question about the year that people came to live in the Netherlands for the first time.

Analyses

The prevalence of smoking and former smoking was assessed by the percentage of smokers and percentage of ex-smokers for each immigrant group, stratified by sex. Ninety-five per cent confidence intervals (95% CI) for proportions were calculated.[19] Both daily smokers as well as occasional smokers were considered as smokers. As the Turkish and Moroccan sample were stratified to 10 year age groups (in contrast to the Surinamese sample), the smoking rates were standardised to the age distribution of the Turkish and Moroccan population in Amsterdam. To assess the association between educational level and the smoking rates and

Table 1 Characteristics of the study population

	Turks n (%) (n = 385)	Moroccans n (%) (n = 316)	Surinamese n (%) (n = 1072)
Percentage female	196 (49.1)	137 (43.4)	675 (63)
Mean age (SD)	46 years (5.8)	46 years (6.0)	44 years (6.2)
Educational level			
No education	150 (39.3)	218 (69)	
Primary education only	189 (49.5)	46 (14.5)	148 (14)
Low vocational training and lower secondary education	19 (5)	27 (8.6)	452 (42.8)
Intermediate vocational training and higher secondary education	17 (4.5)	18 (5.7)	282 (26.7)
Higher vocational training and university	7 (1.8)	7 (2.2)	173 (16.4)
Number of missing cases	n = 3		n = 17
Percentage born in country of origin	385 (100)	316 (100)	1064 (99.3)
Year of migration			
Before 1971	53 (13.8)	46 (14.6)	164 (15.5)
1971–1980	216 (56.1)	160 (50.6)	525 (49.8)
1981–1990	95 (24.7)	86 (27.2)	202 (19.1)
1991 or later	21 (5.5)	24 (7.6)	164 (15.5)
Number of missing cases	–	–	n = 17
Modest or frequent contact with native Dutch	196 (51)	148 (46.8)	697 (65.2)
Number of missing cases	n = 1	–	–
Religion			
Christian	6 (1.6)	2 (0.6)	628 (66.8)
Muslim	307 (81)	311 (98.4)	104 (11.1)
Hindu	–	–	178 (18.9)
Other/no religion	66 (17.4)	3 (0.9)	30 (3.2)
Number of missing cases	n = 6	–	n = 132

proportion of ever smokers, we made cross tabulations and calculated smoking rates for each immigrant group separately. The analyses were stratified by sex and two age groups (35–44 and 45–60 years) as it was possible that socioeconomic gradients of smoking may differ between these subgroups. The associations between smoking and educational level were assessed by calculating the odds ratios (ORs) for smoking in the lowest educational levels (that is, one lowest level for Turkish and Moroccan people and the two lowest levels for the Surinamese people) compared to the two highest educational levels. For the statistical analyses, SPSS 11.5 for Windows was used.[20]

RESULTS

Characteristics of the sample

Table 1 presents the characteristics of the Turkish, Moroccan and Surinamese sample. In accordance with the registry figures, the samples consist almost entirely of first generation immigrants.[21] The mean age of all samples was approximately 45 years. Among the Turkish and Moroccan sample, men and women were evenly distributed, whereas among the Surinamese sample, more women were included. The distribution of educational level was diverse for the three groups, with the Surinamese sample being generally higher educated. Approximately half of the Turks and Moroccans and two thirds of the Surinamese had modest or frequent contact with native Dutch people during their leisure time. Most Turkish and Moroccan people were Muslim, whereas among the Surinamese the religion was more diverse with the majority being Christian.

Prevalence of smoking

The prevalence of smoking and the proportion of former smokers, for the total population as well as per age category, are presented in table 2. The prevalence of smoking differed per ethnic group and sex. Among men, the prevalence was highest among the Turkish (63%) people followed by the Surinamese (55%). Of the Moroccan men 30% were smoking, 32% of the Turkish women and 30% of the Surinamese women smoked, whereas only one (<1%) Moroccan woman smoked. The percentage of ex-smokers ranged from 6% (Turkish women) to 22% (Moroccan men) with the other groups in between. Moroccan women (n = 137) were excluded from further analyses because of the low proportion of smokers.

Most of the smokers were daily smokers. Of the smokers, 5.2%, 8.5% and 1.9% among Turkish, Surinamese and Moroccan men were occasional smokers, respectively, and 7.9% and 7.4% of Turkish and Surinamese women were occasional smokers, respectively.

Regarding the age specific prevalence figures, it appeared that in general the smoking rates among the youngest population were somewhat higher than among the older age group. In addition, among men we found a higher percentage of former smokers in the older age groups, among Moroccan men in particular. Among women, however, we did not see a difference in ex-smokers between age groups.

Association between educational level and smoking

Table 3 presents the socioeconomic gradients for each immigrant population stratified by age and sex. The odds ratios in table 3 reflect the association between educational level and smoking, with the highest two educational levels used as reference. We observed higher smoking rates among men with a lower education. Among Surinamese men this pattern was found in both age groups, in particular among those aged 35–44 years. Among Turkish and Moroccan men this was observed among the younger age groups only. In contrast, among Moroccan men, aged 45–54 years, those with a lower education were less likely to smoke than those with a higher education.

Among Turkish and Surinamese women the smoking rates were higher among higher educated women, with the exception of the Surinamese sample aged 35–44 years.

In fig 1 the socioeconomic gradients of smoking, former smoking and never smoking are shown together in order to gain insight into these gradients with ever smoking. These figures show that similar associations with education were found for ever smokers to those that had been observed for current smokers, indicating that the current situation reflects the smoking patterns of preceding years.

Table 2 Percentage of current smokers and former smokers by ethnicity and sex

		Men			Women		
	Smoking status	Total* (%)	34–44 n (%) (95% CI)	45–54/60 n (%) (95% CI)	Total* n (%) (95% CI)	34–44 n (%) (95% CI)	45–54/60 n (%) (95% CI)
Turks (n = 382)	Current¶	62.8%* (60.5 to 65.1)	64 (69.6) (60.2 to 79.0)	48 (47.5) (37.8 to 57.2)	31.6%* (25.0 to 38.2)	25 (34.2) (23.3 to 45.1)	32 (27.6) (19.5 to 35.7)
	Former	11%* (6.6 to 15.4)	5 (5.4) (0.8 to 10.0)	16 (15.6) (8.2 to 23.0)	5.7%* (2.4 to 9.0)	4 (5.5) (0.3 to 10.7)	7 (6.0) (0.6 to 11.4)
Moroccans (n = 312)	Current¶	30.3%* (23.5 to 37.11)	26 (32.9) (22.5 to 43.3)	25 (26.0) (17.2 to 34.8)	1%* (−0.7 to 2.7)	1 (1.7) (−1.6 to 5.0)	0 (0)
	Former	22.5%* (16.3 to 28.7)	11 (13.9) (6.3 to 21.5)	35 (36.5) (26.9 to 46.1)	<1%*	1 (1.7) (−1.6 to 5.0)	0 (0)
Surinamese§ (n = 1003)	Current¶	55%† (50.1 to 59.9)	126 (56) (49.5 to 62.5)	88 (53.7) (46.1 to 61.3)	30.1%† (26.6 to 33.6)	120 (32) (27.3 to 36.7)	77 (27.6) (22.4 to 32.8)
	Former	13.4%‡ (10.0 to 16.8)	27 (12.0) (7.8 to 16.2)	25 (12,6) (7.5 to 17.7)	9.9%‡ (7.6 to 12.2)	33 (10.0) (7.0 to 13.0)	32 (8.8) (5.5 to 12.1)

*Standardised to age distribution of the Turkish and Moroccan population in Amsterdam.
†Prevalence includes 3.6% (men) and 3.8% (women) smokers who smoke cigars only (these persons were excluded from further analyses because of different smoking patterns).
‡Prevalence includes 0.4% ex-smokers that smoked cigars only (men).
§2nd generation was excluded from analyses (0.7% of the sample).
¶Prevalence includes daily and occasional smokers.

DISCUSSION

This study aimed to assess whether the socioeconomic gradients of smoking behaviour in immigrant populations across the stages of the tobacco epidemic differ from those in the Western host populations. The prevalence rates and smoking related mortality rates among men and women suggest that the immigrant populations are in earlier stages than the ethnic Dutch, who are in stage 4. Moroccans appeared to be in stage 1 or 2, the Surinamese in stage 2, and the Turks appeared to be at the end of stage 2 or the beginning of stage 3. In accordance with our hypothesis, the results indicate that whereas the prevalences suggest that immigrants are in the earlier stages, the socioeconomic gradient among men already appears to be reversing, with higher smoking rates among people with low levels of education (among Turks and Moroccans), or have already reversed (among the Surinamese). Among women, however, the gradient is still positive (among Turkish women), or is tending to reverse into a negative gradient (among Surinamese women).

Our study is one of the first to present the prevalence of smoking among immigrant populations stratified by age and sex. These data enable the interpretation of smoking patterns among immigrants in the context of the worldwide smoking trends. However, some limitations of the study need to be considered. A first limitation is the cross-sectional character of the study, implying that we cannot assess smoking trends in several time periods. Therefore, we cannot be sure about our assessment of the stages the immigrants are in. However, the differences in smoking prevalence among the age groups as well as the prevalence of their smoking related mortality suggest that the positioning of the immigrant groups in the earlier stages is likely. Moreover, the percentage of former smokers among men are higher in the oldest age groups, indicating that quitting is not increasing in the younger age group. However, longitudinal or trend studies are needed to confirm our hypothesis.

Secondly, there are no figures about the exact response rates of the Turkish and Moroccan sample. A proportion of the sample was approached less than the required five times and therefore it is not known if these persons would have been responders or non-responders. A comparison of the respondents with census data from the municipal registry, including all Turks and Moroccans aged 35–54 years in Amsterdam, showed that there are no differences for the Moroccan people. Among Turks there were relatively more married people in the sample. Since smoking may be more prevalent among single men, the prevalence may therefore have been underestimated which means that the prevalence of smoking among Turkish men may be even higher than 63%.

A third limitation, as in most other studies, is the use of self-reported data on smoking, which may have resulted in an under-reporting of smoking behaviour. This may especially be the case in groups where smoking is seen as inappropriate, such as among women.[22 23] It might be that the prevalence among women would be higher than we found. For our study under-reporting would especially be a problem if it was associated with educational level. Previous studies, however, suggest that this association is weak and that self-report on smoking appears to be a good indicator of actual smoking status.[24]

Several studies in the United States and the United Kingdom have investigated the smoking prevalence among immigrant populations. Low prevalence of smoking was found for Hispanic, Southeast Asian or South Asian women, and very high prevalence was found for male populations, such as Bangladeshi and Southeast Asian men, indicating that these populations are also in the earlier stages of the

Table 3 Percentages of smoking according to educational level*† by age and sex

	Age	Educational level 1 % (n)	2 % (n)	3 % (n)	4 % (n)	5 % (n)	OR (95% CI)‡ highest two levels are reference
Men							
Turkish men*	35–44	80 (32)	65 (26)	40 (4)			2.67 (1.02 to 6.96)
	45–54	46.2 (12)	44.4 (28)	66.7 (8)			0.93 (0.38 to 2.27)
Moroccan men*	35–44	41.7 (15)	33.3 (5)	21.4 (6)			2.08 (0.80 to 5.39)
	45–54	17.7 (14)	57.1 (4)	70 (7)			0.12 (0.04 to 0.37)
Surinamese men†§	35–44		80 (28)	55.3 (57)	48.9 (23)	24.1 (7)	2.46 (1.39 to 4.37)
	45–54		60.7 (17)	53.4 (39)	46.9 (15)	42.9 (9)	1.50 (0.77 to 2.93)
Women							
Turkish women*	35–44	25 (4)	30.8 (12)	50 (9)			0.57 (0.16 to 2.00)
	45–54	25 (17)	26.7 (12)	100 (3)			0.73 (0.32 to 1.67)
Surinamese	35–44		33.3 (10)	29.6 (45)	33.6 (41)	17.3 (9)	1.07 (0.68 to 1.69)
women†§	45–60		15.1 (8)	25 (24)	30.2 (16)	24.6 (15)	0.73 (0.42 to 1.29)

*Educational level among Turkish and Moroccan immigrants: 1, no education, 2, primary education; 3, at least low vocational education.
†Educational level among Surinamese immigrants: 2, max primary education; 3, low vocational training and lower secondary education; 4, intermediate vocational training and higher secondary education; 5, higher vocational training and university.
‡OR for Surinamese lowest two educational levels were compared to highest two levels.
§Persons born in the Netherlands were excluded from analyses.
CI, confidence interval; OR, odds ratio.

tobacco epidemic.[25–28] Part of these studies also assessed the socioeconomic gradients among immigrant populations. The outcomes of these studies are in line with ours, in the sense that only one study found higher smoking rates among people with a high socioeconomic status and some studies already found reversed gradients.[27–30] Other studies, however, reported unclear socioeconomic gradients. An explanation for this may be that none of these studies were stratified according to both age and sex.[25 26 31–34] In our data we noticed different smoking patterns for men and women in different age groups. These patterns diminished when age groups or male and female data were aggregated (data not shown). Hence, to gain insight into the changing pattern of the socioeconomic gradients of smoking in immigrant populations, future research should stratify populations by age and sex.

Our results may suggest that in immigrant populations as well, smoking spreads through the population according to the diffusion of innovations,[13] starting among people with higher levels of education and followed by those with lower

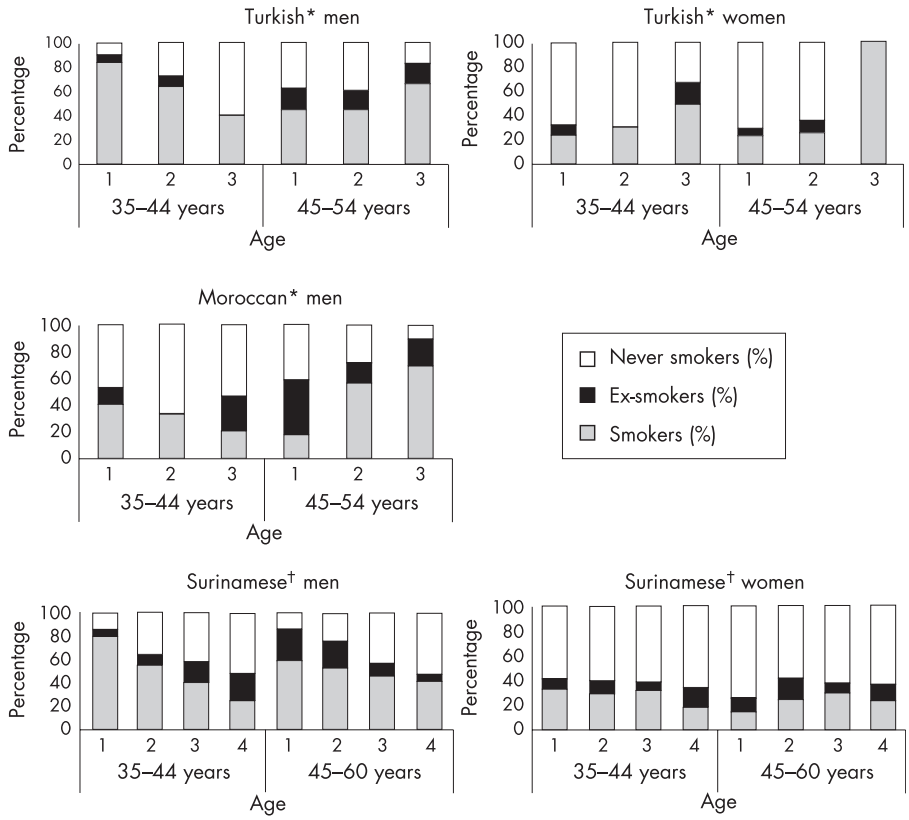

Figure 1 Percentage of smokers, ex-smokers and never smokers according to educational level in Turkish, Moroccan and Surinamese immigrants. *Educational level among Turkish and Moroccan immigrants: 1 = no education; 2 = primary education; 3 = at least low vocational education. †Educational level among Surinamese immigrants: 1 = max primary education; 2 = low vocational training and lower secondary education; 3 = intermediate vocational training and higher secondary education; 4 = higher vocational training and university.

levels of education. In our samples we used different educational categories for Turks and Moroccans on the one side and Surinamese on the other side. This implies that we cannot interpret the absolute scores of odds ratios. However, we did see the gradient from low to high educational level indicating that the association of education and smoking is comparable within the immigrant groups.

In accordance with our hypothesis, the results may suggest that the socioeconomic gradient reverses earlier in the epidemic, which may be explained by an earlier uptake of smoking among people with lower educational levels or an earlier decline in smokers with higher educational levels than that known in Western populations.[8 9 14] This might be the result of contextual influences related to immigration, such as the exposure to health promotion messages and the contacts with the host population in which the socioeconomic gradient is already reversed. The early change in socioeconomic gradient appeared to exist among the male populations in particular. However, a reversed socioeconomic pattern was not found among women. This might indicate that this reversed pattern has just started and, according to the tobacco epidemic, that women will follow some years later. So, although the diffusion of smoking throughout socioeconomic groups in populations follows the same pattern as those in Western countries, it appears to be accelerated by migration. We found these indications in a study among immigrant populations in the Netherlands. We believe, however, that these might also apply to non-Western immigrant populations in other Western countries that are in the later stages of the epidemic; this is because the general principles of changing smoking behaviour (that is, availability of smoking prevention activities and higher smoking rates among people with lower levels of education in stage 4 countries[7]) seems to be similar for these populations. This should be tested in future studies.

Our results may provide insight into several aspects that are relevant for prevention. Firstly, these figures help to reveal current smoking patterns and may enable us to predict future smoking trends. The results predict increases in smoking prevalence and this increase may take place more rapidly than can be expected from the tobacco epidemic alone: the ''special context'' migrants find themselves in (because of their contacts with the host county) seems to accelerate the uptake of smoking among people with lower levels of education in particular. Hence, the time span between the uptake of smoking among people with lower and higher levels of education will become shorter than the time span observed in stage 4 countries. This might result in a fast increase in smoking prevalence in immigrant groups, which would be most visible in the younger age groups as they are more at risk in the uptake of smoking. This implies there is no time to lose if we want to prevent an epidemic in smoking among immigrant populations who currently have a relatively low prevalence of smoking. These interventions should be focused on preventing the uptake in these populations in particular, in addition to focusing on quitting smoking in other populations, such as the Turkish and Surinamese men and women.

Secondly, related to the first point, the results of this study may provide insight into the trends in smoking-related diseases in immigrant populations. Studies about mortality and morbidity, for example, found unexpectedly relatively weak socioeconomic gradients in cardiovascular mortality in immigrant populations in Western countries, such as the Turkish and Moroccan populations in the Netherlands and ethnic South Asians in the UK.[35] Our results indicated that these can be explained by the fact that socioeconomic patterns among those in the highest age groups may not yet exist.

What this paper adds

Smoking behaviour diffuses through a population in a four-stage pattern known as the tobacco epidemic. Studies among Western populations show that socioeconomic patterns appear to change across these stages, starting with higher smoking rates among higher socioeconomic groups to higher smoking rates among lower socioeconomic groups. However, no information is available about these socioeconomic gradients among immigrant populations in Western host countries.

This study provides indications to suggest that the socioeconomic gradients reverse earlier in the tobacco epidemic in the immigrant populations than in the Western host population among the male population in particular. Consequently, to stop the future smoking epidemic in immigrant populations, prevention programmes need to be particularly tailored to males in lower socioeconomic groups and to females in higher socioeconomic groups.

Thirdly, we find that the socioeconomic gradient may change into a negative gradient in earlier stages than in Western populations. Hence, prevention should focus on lower socioeconomic groups in some populations, such as Surinamese and Moroccan men, while they are in earlier stages of the epidemic. Also, the socioeconomic gradient provides insight into the prevailing norms about smoking, as smoking may be regarded as a high status symbol in populations where smoking is more prevalent among higher socioeconomic groups, such as the female populations in this study.

Furthermore, as this is one of the first studies among immigrant populations, more research is needed to obtain better insight into the process of diffusion of smoking through immigrant populations. Therefore, future research should focus on immigrant populations as well.

In conclusion, this study provides indications to suggest that the socioeconomic gradients reverse earlier in the tobacco epidemic in the immigrant populations than in the Western host population among the male population in particular. Consequently, to stop the future smoking epidemic in immigrant populations, prevention programmes need to be particularly tailored to males in lower socioeconomic groups and to females in higher socioeconomic groups. More longitudinal or trend studies about these smoking patterns are needed in order to understand the process of smoking diffusion in immigrant populations.

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The Ligher Side