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Cancer Mortality among North African Migrants in France

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Background. Data on cancer mortality in North African migrants to France (the largest foreign-born community in the country) are presented, providing useful insights both into cancer patterns in North Africa and their changes following migration.

Methods. The cancer mortality in migrants from North Africa (Algeria, Morocco, Tunisia and Egypt) resident in France relative to that of the local-born population, is estimated from mortality data for the period 1979–1985, and population data from the 1982 French census. Risks of death from different cancers were adjusted for important confounding factors such as social status and area of residence.

Results. The risks are quite similar for Algerian, Tunisian and Moroccan migrants. Compared to the local-born, those Maghrebian migrants of one or both sexes have higher risks of death from cancer of the nasopharynx, gallbladder and bladder (in Algerians only). Conversely, Maghrebian migrants have lower risks of death from cancer of the oral cavity, other pharynx, oesophagus, stomach, colon, rectum, lung, larynx, melanoma (in Algerians only), kidney and nervous system (except in Tunisians), breast, ovary, and cervix uteri (except in Moroccans). For Egyptian migrants, because of small numbers, few of the estimates are statistically significant. They are at lower risk of death from lung cancer and at higher risk for lymphoma and leukaemia.

Conclusion. The findings provide confirmatory evidence of the unusual cancer patterns among North African populations, who have low risks for most cancer sites, and high risks for certain cancers, such as of the nasopharynx and bladder.

Keywords: migrants, cancer, mortality, relative risk, North Africa

France has long been a country of immigration. At the beginning of the 20th century, most migrants came from other European countries, but in the 1950s, a new wave of migrants arrived from the North African countries that had formerly been French territory or colonies. By 1982, there were more than 2 million North African-born individuals in France, representing nearly 40% of the foreign-born population. Most of them were born in Algeria (60%), Morocco (23%) or Tunisia (15%).

There is little available information on cancer patterns in North African countries[1–3] and to date, the only data on cancer patterns among North African migrants concern Jewish populations in Israel,[4] and Egyptian migrants to New South Wales, Australia.[5,6]

In the present paper we report on patterns of cancer mortality among Algerian, Tunisian, Moroccan and Egyptian migrants to France, using mortality data for the period of 1979–1985, and the population at risk estimated from the 1982 census. Since area of residence and social class are important determinants of cancer risk and differ substantially between the migrants and local-born populations, the estimates on risks of death were adjusted for these important confounding factors.

MATERIALS AND METHODS

For purpose of this study, 'natives' refers to individuals born in metropolitan France and 'Maghrebian migrants' refers to people born in Algeria, Morocco and Tunisia; 'North African migrants' includes also those born in Egypt.

Study design and methodology have been described in detail in a previous article.[7] Briefly, the population data were provided by the 'Institut National de la Statistique et des Etudes Economiques' (INSEE), and were derived from the French 1982 census, cross-tabulated by age, sex, departement of residence, social class and country of birth. Mortality data consisted of 3 822 811 records of deaths which occurred within the resident population of France during the period 1979–1985, and were provided by INSERM. For each death, there was information on age at death, sex, departement of residence, year of death, the last socio-professional group

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TABLE 1 *Distribution of the population (in per cent) by country of birth, age, area of residence and sex, according to the 1982 census*[a]

	Country of birth				
	France	Algeria	Morocco	Tunisia	Egypt
Age groups					
0–14	22.4	4.6	11.4	4.5	2.2
15–44	42.5	53.1	67.9	59.0	45.2
45–64	21.4	29.8	18.8	26.2	31.0
65+	13.8	12.4	1.8	10.3	21.5
Area of residence					
Capital area	16.9	26.0	27.4	34.9	66.6
North	32.2	13.5	18.5	7.7	5.2
West	14.8	4.8	7.0	3.7	2.1
East	16.8	16.3	15.0	14.5	6.1
South	19.3	39.5	32.2	39.3	20.0
Sex					
Male	48.4	55.3	58.0	55.0	56.1
Female	51.6	44.7	42.0	45.0	43.9
Total number	48 271 840	1 439 820	548 500	358 220	18 900

[a] Population data are provided by l'Institut National de la Statistique et des Etudes Economiques (INSEE).

of the deceased, cause of death and country of birth. The variable 'detailed socio-professional status' was recorded into five categories of social class (high, medium, low, other, retired) corresponding to the categories used in the census. Departement of residence was regrouped into five areas. Cause of death was coded according to the 9th Revision of the International Classification of Diseases (ICD-9). The risk of death from different cancers in North-African migrants, relative to the metropolitan-born population in France, was estimated by using Poisson regression.[8] All models were fitted using the GLIM statistical package,[9] and were additive on the logarithmic scale. The variables included in the model were: age group, sex (when relevant), area of residence, social class and birthplace (France-born, Algeria-born, Morocco-born, Tunisia-born, Egypt-born, other birthplace). Relative risks of death from different cancers are presented rounded to one place of decimal, so that values between 0.95 and 1.04 will appear in the Tables as 1.0.

Maghrebian migrants are not a homogenous group; the population born in the Maghrebian countries includes individuals of French origin who returned to France after the granting of independence and Maghrebian migrants of Arabian origin. These two populations have quite different ethnic and professional profiles; the Maghrebian migrants are for the most muslims and belong to the working classes, which is not the case for the repatriated French. Stratified analyses by socioeconomic subgroup were therefore undertaken in order to detect differences between the two subpopulations within the group of 'North African migrants'.

Three indicators of quality of mortality data were calculated: (i) the percentage of deaths certified with senility or ill-defined causes of death (ICD-9 codes 780–799); (ii) the percentage of all cancer deaths classified as due to cancer of ill-defined sites (ICD-9 codes 159, 165, 195–9) and the percentage of all uterus cancer deaths classified as uterus, not otherwise specified (ICD-9 179). The percentages were age-standardized by the direct method, taking as standard proportions the deaths observed in the French metropolitan population for the period studied.

RESULTS

About 1 440 000 Algerian, 550 000 Moroccan, 360 000 Tunisian and 18 000 Egyptian migrants were resident in France in 1982, representing 39% of the foreign-born population. Most of the Maghrebian migrants were aged between 25 and 64 years, and compared to natives, children <15 and adults >65 were under-represented (Table 1). Egyptian migrants were of older average age than the other groups.

Migrants and natives differ substantially with respect to place of residence (Table 1) and social class (Table 2). Maghrebian migrants live mostly in the Paris

TABLE 2 *Social class distribution (in per cent) by country of birth and sex among the population aged 35–64 years, according to the 1982 census*[a]

	Country of birth									
	France		Algeria		Morocco		Tunisia		Egypt	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Social class										
High	12.6	3.3	8.7	3.3	9.5	4.7	12.6	4.4	47.7	15.7
Medium	24.2	27.1	20.0	25.3	16.6	25.9	22.1	24.8	23.0	31.9
Low	47.7	22.7	57.8	11.1	66.3	13.6	54.6	12.2	19.3	5.7
Retired	10.4	6.8	6.5	4.5	2.7	2.3	4.5	3.6	3.3	4.6
Other	5.1	40.2	7.1	55.9	5.0	53.5	6.3	55.1	6.6	42.1
Total number	7 642 260	8 079 100	461 360	287 920	99 100	70 900	144 720	78 860	4860	4320

[a] Population data are provided by l'Institut National de la Statistique et des Etudes Economiques (INSEE).

area and in the South of France (mainly Provence-Côte d'Azur). They belong to a lower social stratum than the natives, as nearly half of the men of working age are skilled or unskilled workers. This is most evident for Moroccan migrants. Most of the Egyptian migrants live in the Paris area and in Provence-Côte d'Azur, but belong to higher social strata than natives. Most women born in North Africa have no professional activity.

Compared to other European countries, the quality of French mortality data is rather poor, with 6% of deaths certified with ill-defined causes, 12% of cancer deaths with ill-defined sites, and 63% of uterus cancer deaths which are not otherwise specified. Within France, however, the three indicators of data quality were almost identical for the different groups of North African migrants and for natives.

The number of cancer deaths, and risks of death for North African migrants relative to natives, by cancer site are reported in Tables 3 and 4 for males and females respectively. Because of the small population at risk, less than 400 cancer deaths were registered among Egyptian migrants. In males, the most common cause of cancer death in natives, as well as in migrants, is lung cancer, followed by prostate cancer in natives and in Algerian, Tunisian and Egyptian migrants, and stomach cancer in Moroccan migrants. Breast cancer is the most common cancer death in women, colon cancer is the second in natives, Algerian, Tunisian and Egyptian migrants, although ovary cancer is the second most common cause of cancer deaths in Moroccan migrants.

All the presented relative risks of death are adjusted for age, social class and area of residence. Relative risks for sites with less than two deaths are not reported.

The risks are quite similar for Algerian, Tunisian and Moroccan migrants. Compared to the local-born, those Maghrebian migrants of one or both sexes have higher risks of death from cancer of the nasopharynx, gallbladder and bladder (in Algerian migrants only). Conversely, Maghrebian migrants have lower risks of death from cancer of the oral cavity, other pharynx, oesophagus, stomach, colon, rectum, lung, larynx, melanoma (in Algerian migrants only), kidney and nervous system (except in Tunisian migrants), Hodgkin's disease (in Moroccan migrants only), breast, ovary, and cervix uteri (except in Moroccan migrants). For Egyptian migrants, because of small numbers, few of the estimates are statistically significant. They are at lower risk of death from lung cancer and at higher risk for lymphoma and leukaemia.

The results stratified by social class are shown in Figure 1. The reduced risks of cancer death in migrants, compared to natives, are more marked in the lower socioeconomic group (which includes skilled and unskilled manual workers) than among the higher socioeconomic group (engineers, managers, professionals). In the upper socioeconomic stratum, the apparent higher risk of death from stomach cancer among Moroccan migrants was based on few cases, and is hence not statistically significant.

DISCUSSION

Compared to the local-born population, North African migrants in France experience quite different cancer patterns, with lower mortality rates for most sites, except for a few specific sites such as nasopharynx, bladder and lymphoma.

It is possible that part of the apparently lower cancer mortality among migrants could be due to the return of ill migrants to their country of origin prior to death,

TABLE 3 *Site distribution of cancer deaths by sex and country of birth, and relative risks (RR)[a] for migrants relative to France-born individuals among males*

ICD-9	Site	Country of birth												
		France		Algeria			Morocco			Tunisia			Egypt		
		No	RR	No	RR	(95% CI)	No	RR	(95% CI)	No	RR	(95% CI)	No	RR	(95% CI)
141–5	Oral cavity[b]	11 836	1.0	270	0.5***	(0.4–0.6)	40	0.4***	(0.2–0.5)	44	0.4***	(0.3–0.6)	4	0.5	(0.2–1.4)
146, 8, 9	Other pharynx	20 047	1.0	351	0.4***	(0.4–0.5)	37	0.2***	(0.1–0.3)	43	0.3***	(0.2–0.3)	5	0.4*	(0.2–1.0)
147	Nasopharynx	578	1.0	57	2.1***	(1.6–2.8)	15	2.5***	(1.5–4.3)	16	2.8***	(1.7–4.6)	0		
150	Oesophagus	29 896	1.0	449	0.4***	(0.4–0.5)	48	0.2***	(0.2–0.3)	64	0.3***	(0.2–0.4)	5	0.2**	(0.1–0.6)
151	Stomach	28 349	1.0	717	0.8***	(0.8–0.9)	76	0.7***	(0.5–0.8)	116	0.7***	(0.6–0.9)	7	0.4**	(0.2–0.8)
153	Colon	30 144	1.0	638	0.7***	(0.6–0.7)	59	0.5***	(0.4–0.6)	121	0.6***	(0.5–0.8)	20	0.7	(0.5–1.2)
154	Rectum	16 433	1.0	317	0.6***	(0.6–0.7)	30	0.5***	(0.3–0.6)	60	0.6***	(0.5–0.8)	6	0.5	(0.2–1.1)
155	Liver	18 028	1.0	600	1.0	(0.9–1.0)	77	0.8	(0.6–1.0)	106	0.8	(0.7–1.0)	9	0.6	(0.3–1.2)
156	Gallbladder	3212	1.0	139	1.3**	(1.1–1.6)	14	1.1	(0.7–1.9)	17	0.8	(0 5–1.3)	0		
157	Pancreas	16 405	1.0	536	0.9	(0.9–1.0)	61	0.7**	(0.5–0.9)	98	0.9	(0.7–1.0)	8	0.6	(0.3–1.2)
161	Larynx	23 230	1.0	550	0.6***	(0.5–0.6)	49	0.2***	(0.2–0.3)	89	0.5***	(0.4–0.6)	1		
162	Lung	94 395	1.0	3545	0.9**	(0.9–1.0)	399	0.6***	(0.6–0.7)	695	0.9*	(0.9–1.0)	43	0.5***	(0.4–0.7)
172	Melanoma	2140	1.0	68	0.7*	(0.6–0.9)	21	0.9	(0.6–1.4)	15	0.7	(0.4–1.2)	1		
185	Prostate	45 613	1.0	933	0.8***	(0.7–0.8)	66	0.7**	(0.5–0.9)	162	0.7***	(0.6–0.8)	34	1.0	(0.7–1.4)
186	Testis	1285	1.0	24	0.5***	(0.3–0.7)	8	0.4**	(0.2–0.8)	7	0.5	(0.2–1.1)	0		
188	Bladder	16 418	1.0	706	1 2***	(1.1–1.3)	48	0.7*	(0.5–0.9)	134	1.1	(0.9–1.3)	17	1.0	(0.6–1.7)
189	Kidney	9485	1.0	270	0.8***	(0.7–0.9)	34	0.6**	(0.4–0.9)	53	0.8	(0.6–1.0)	3	0.3	(0.1–1.1)
191, 2	Nervous system	6395	1.0	221	0.8**	(0.7–0.9)	36	0.6***	(0.4–0.8)	44	0.8	(0.6–1.0)	5	0.9	(0.3–2.4)
201	Hodgkin's disease	1764	1.0	89	1.2	(0.9–1.5)	9	0.4**	(0.2–0.7)	21	1.1	(0.7–1.8)	3	2.4	(0.8–7.4)
200, 2	Other lymphoma	6588	1.0	238	1.0	(0.9–1.1)	49	1.0	(0.8–1.4)	56	1.1	(0.9–1.5)	9	1.9*	(1.0–3.7)
204–8	Leukaemia	14 955	1.0	524	1.1	(1.0–1.2)	78	0.8	(0.7–1.0)	100	1.0	(0.8–1.2)	11	0.9	(0.5–1.7)
140–208	All sites	470 025	1.0	13 462	0.8***	(0.8–0.8)	1514	0.6***	(0.5–0.6)	2527	0.8***	(0.7–0.8)	228	0.6***	(0.5–0.7)

[a] Relative risks are adjusted for age, social class and area of residence.
[b] Excludes salivary glands (ICD-9 code 142).
* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

TABLE 4 *Site distribution of cancer deaths by sex and country of birth, and relative risks (RR)[a] for migrants relative to France-born individuals among females*

ICD-9	Site	Country of birth												
		France		Algeria			Morocco			Tunisia			Egypt		
		No	RR	No	RR	(95% CI)	No	RR	(95% CI)	No	RR	(95% CI)	No	RR	(95% CI)
141–5	Oral cavity	1519	1.0	37	0.8	(0.6–1.2)	3	0.5	(0.2–1.5)	6	0.6	(0.3–1.2)	2		
146, 8, 9	Other pharynx	1417	1.0	24	0.5**	(0.4–0.8)	7	1.0	(0.5–2.2)	3	0.3*	(0.1–0.9)	2		
147	Nasopharynx	207	1.0	9	1.6	(0.8–3.2)	2	1.9	(0.5–7.9)	3	2.2	(0.7–7.0)	0		
150	Oesophagus	3889	1.0	56	0.6***	(0.5–0.8)	8	0.8	(0.4–1.6)	11	0.5*	(0.3–0.9)	2		
151	Stomach	21 577	1.0	395	0.8**	(0.8–1.0)	30	0.9	(0.6–1.3)	82	0.9	(0.7–1.1)	5	0.6	(0.2–1.5)
153	Colon	33 165	1.0	659	0.8***	(0.8–0.9)	40	0.6***	(0.4–0.8)	114	0.7***	(0.6–0.8)	17	1.1	(0.7–1.8)
154	Rectum	13 069	1.0	231	0.7***	(0.6–0.8)	13	0.4**	(0.2–0.7)	54	0.8	(0.6–1.1)	4	0.7	(0.3–1.8)
155	Liver	8218	1.0	238	1.1	(1.0–1.3)	22	1.1	(0.7–1.6)	48	1.1	(0.8–1.4)	4	1.1	(0.8–1.4)
156	Gallbladder	6962	1.0	195	1.3***	(1.1–1.5)	13	1.1	(0.6–1.8)	34	1.1	(0.8–1.5)	1		
157	Pancreas	13 187	1.0	353	1.1	(1.0–1.2)	33	1.2	(0.9–1.8)	71	1.1	(0.8–1.3)	10	1.7	(0.9–3.1)
161	Larynx	1123	1.0	19	0.6*	(0.3–0.9)	5	1.0	(0 4–2.5)	5	0.6	(0.3–1.5)	0		
162	Lung	12 930	1.0	327	0.9*	(0.8–1.0)	35	0.8	(0.6–1.1)	69	0.8	(0 6–1.0)	8	1.0	(0.5–2.0)
172	Melanoma	2374	1.0	49	0.7*	(0.5–1.0)	10	0.7	(0.4–1.4)	10	0.6	(0.3–1.2)	0		
174	Breast	56 493	1.0	1320	0.8***	(0.8–0.9)	173	0.7***	(0.6–0.8)	317	0.9**	(0.8–1.0)	30	0.9	(0.6–1.3)
179	Uterus NOS	14 051	1.0	286	0.8***	(0.7–0.9)	36	0.8	(0.6–1.1)	49	0.6***	(0.4–0.8)	7	1.0	(0.5–2.1)
180	Cervix	5489	1.0	123	0.8*	(0.7–1.0)	27	1.0	(0.7–1.5)	18	0.5**	(0.3–0.8)	1		
182	Corpus	2900	1.0	50	0.8*	(0.6–1.0)	7	1.0	(0.5–2.2)	13	1.0	(0.5–1.6)	0		
183	Ovary	16 331	1.0	322	0.8***	(0.7–0.9)	44	0.7*	(0.5–0.9)	62	0.7**	(0.5–0.8)	10	1.2	(0.6–2.3)
188	Bladder	5784	1.0	154	1.0	(0.9–1.2)	9	0.9	(0.5–1.7)	30	1.0	(0.7–1.4)	2		
189	Kidney	6118	1.0	122	0.8*	(0.7–1.0)	10	0.6	(0.3–1.1)	25	0.8	(0.5–1.1)	3	1.1	(0.4–3.4)
191, 2	Nervous system	4658	1.0	135	1.0	(0.8–1.2)	15	0.6*	(0.3–0.9)	32	1.0	(0.7–1.4)	2		
201	Hodgkin's disease	1186	1.0	38	1.0	(0.7–1.4)	7	0.8	(0.4–1.6)	6	0.7	(0.3–1.5)	2	3.8	(1.0–1.5)
200, 2	Other lymphoma	5613	1.0	147	1.0	(0.8–1.2)	15	0.8	(0.5–1.3)	42	1.2	(0.9–1.7)	4	0.7	(0.2–2.8)
204–8	Leukaemia	13 223	1.0	344	1.0	(0.9–1.1)	42	0.8	(0.6–1.0)	76	1.0	(0.8–1.3)	13	2.1*	(1.2–3.7)
140–208	All sites	318 719	1.0	7242	0.9***	(0.9–0.9)	732	0.8***	(0.7–0.8)	1485	0.8***	(0.8–0.9)	162	1.0	(0.9–1.2)

[a] Relative risks are adjusted for age, social class and area of residence.
[b] Excludes salivary glands (ICD-9 code 142).
* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

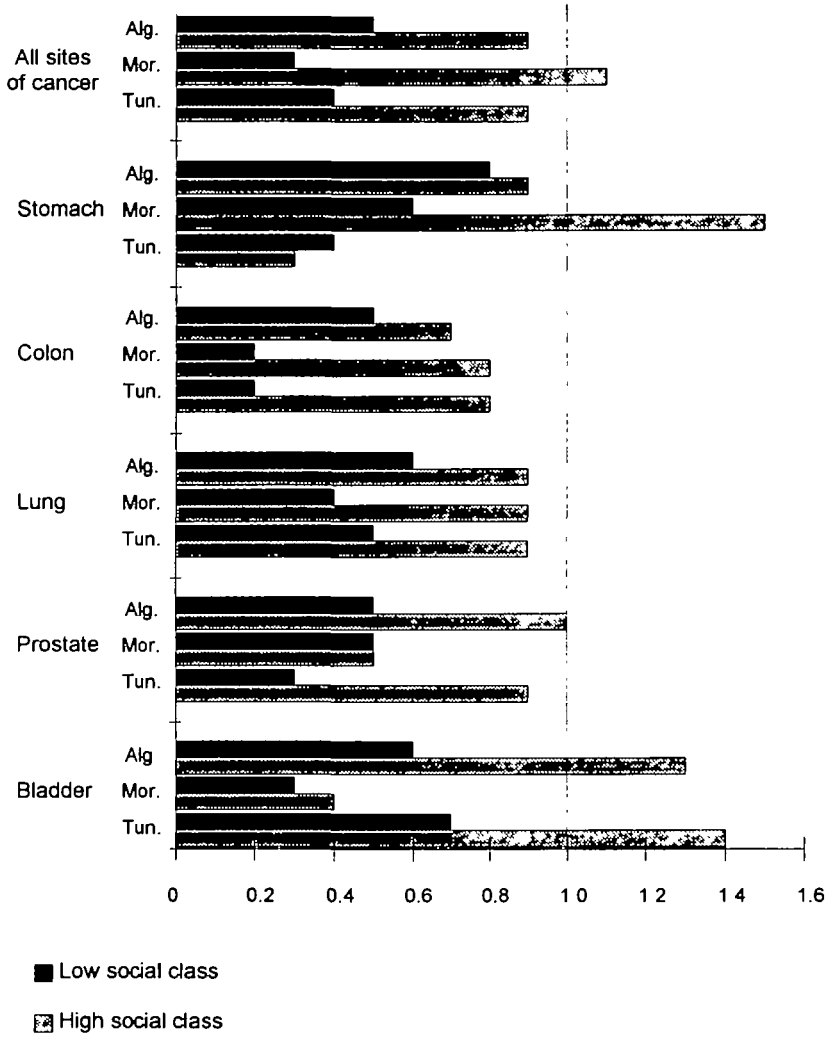

FIGURE 1 *Risk of cancer death among migrants compared to natives, within two social classes, males 35–64 years*

Alg. Algeria-born
Mor. Morocco-born
Tun. Tunisia-born

though it is impossible to evaluate the numbers involved since there are no precise statistics on the departure of migrants, and no information on the reasons for their return to their countries of origin. Any 'healthy migrant effect' resulting from restrictive immigration policies (preventing ingress of cancer patients) is likely to be small, since more than 80% of the North African citizens in 1982 were already residents in France in 1975.

In order to evaluate the extent of the change in risk after migration, data from the region of birth must be available. In North African countries, there are few reliable estimates of cancer occurrence. In Algeria, the cancer registry of Setif has provided incidence data since 1986.[1] For Tunisia and Morocco, the only data are the relative frequencies of different cancers provided by hospital registries.[2,3] For Egypt, national mortality data of questionable validity are published by The World Health Organization.

When comparing the risks of death from cancer in migrants with the cancer patterns in their home countries, it is important to remember that North African

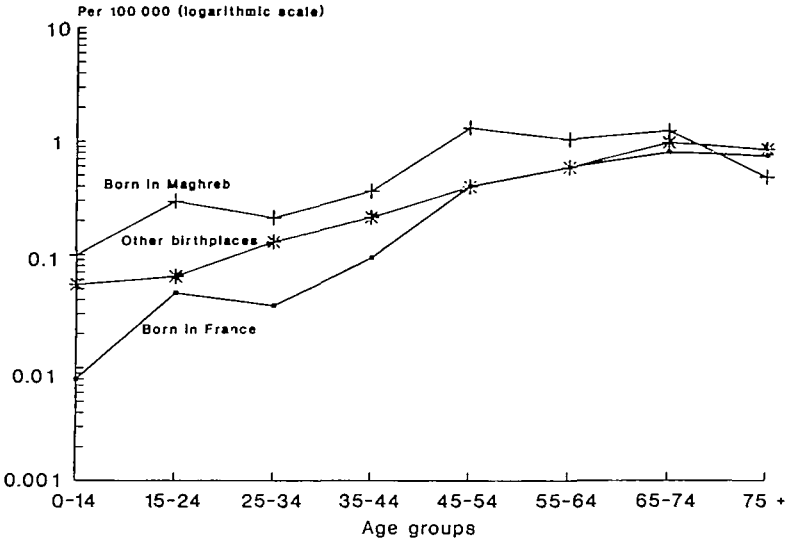

FIGURE 2 *Mortality rate for nasopharyngeal cancer by country of birth, among both sexes, France 1979–1985*

migrants in France are not representative of the population living in Maghrebian countries. In fact, they include both Maghrebian Arabs (about 40%) coming to France in order to work (principally as skilled or unskilled workers), and French (about 60%)[10] born in these countries during the French protectorate. As seen in Figure 1, differences in risk of death from most cancers between natives and migrants are greater among workers (including principally Maghrebian Arabs) than among the highest socioeconomic groups (including principally French nationals born in North African countries).

Moreover, North African migrants in France have undergone considerable processes of selection. The Algerian population in France is characterized by a large proportion of young adults, who are mostly workers in heavy industries or in construction, and their geographical distribution in France is largely determined by the location of these industries. The Moroccan workers are more involved in mining and agriculture, whereas the Tunisians are more active in the food trade, textile industry and services. They are very different from North African migrants to Israel, who are of course almost all Jews. Despite this, the results suggest that migrants in France show quite similar cancer patterns to those observed in their countries of origin, and to those found among North African migrants to Israel.[4]

Nasopharyngeal Cancer (NPC)

The highest incidence or mortality rates for this cancer are observed in Hong Kong, China and South-East Asia, with the Maghrebian countries being at intermediate risk.[1,2] In these medium-risk populations of North Africa, the age-specific incidence curve is unusual in showing a first peak of occurrence in young adults, followed by a second peak after the age of 50.[11] As a result, NPC is a relatively common tumour among children in North Africa (10–20% of children's tumours), whereas it is rare in childhood elsewhere, even in Chinese populations.[12] As in the North African migrants in Israel[4] and in Egyptian migrants in Australia,[6] the risk of death from nasopharyngeal cancer in North African migrants in France is twice as high as in natives and, as observed for incidence data in their countries of origin.[11] This cancer shows two peaks of mortality among migrants: the first between the age of 10 and 20 years, and the second peak later in life, at the age of 55–65 years (Figure 2). The early peak is also observed among the population born in France, probably because of the substantial number of young people who are offspring of Maghrebian migrants.

Nasopharyngeal cancer has been linked to a number of factors, including dietary items, occupational exposures and the Epstein-Barr virus.[13] A case-control study of NPC in Tunisia found that cured spiced meat (quaddid), pickled vegetables and olives, basic stewing preparation (mixture of red and black pepper, garlic, oil, caraway and coriander), salted anchovies and harissa (red pepper, olive oil, garlic, caraway, salt), taken as a snack during childhood and youth, were related to an increased risk of death from NPC.[14]

Alcohol- and Tobacco-related Cancers

Data from a French national survey show that, compared to French nationals, Maghrebian migrants have a lower consumption of alcohol and a higher tobacco intake.[15] A high percentage of Maghrebian Arab migrants of the first generation respect the religious prohibition on alcohol, and this is accompanied by a lower mortality risk than in natives for upper aero-digestive and liver cancers.

Smoking of Maghrebian migrants in France appears to be a very prevalent habit in men.[15] Despite their heavy tobacco smoking; and probably a higher occupational exposure (i.e. related to metallurgic or mining employment), North African migrants have lower mortality risks from lung cancer than natives. This apparent protection is even more marked in the lower social stratum. This low mortality could possible relate to protective factors in the diet, which is particularly rich in vegetables.[15]

Digestive Cancer

The incidence of colon cancer appears to be very low in Algeria,[1] while for stomach cancer, it is quite similar to that in France.[16] North African migrants in France have relatively low risks of death from cancers of the colon, rectum and stomach. Migrants from North Africa to Israel also have colon and rectum cancer incidence rates about half of those of European migrants,[4] and a low risk of death from these cancers, compared to natives, is also observed in Egyptian migrants to Australia.[5,6] Concerning stomach cancer, North African migrants in Israel have a lower risk of mortality than all Jews.[4] Great differences in dietary habits were observed in France between Maghrebian migrants and French natives.[15] North African Arabs have traditional diets rich in cereals (wheat), legumes (chick peas, lentils), green vegetables and fruits and poor in animal fats and grilled meat, which may protect them from colo-rectal as well as from stomach cancer.

Gallbladder cancer is the second most common cancer in women in Algeria[1] and Algerian migrants of both sexes have a higher risk of death from this cancer than natives. Compared to the Jewish population as a whole in Israel, North African migrants also have a significantly increased incidence.[4] A higher risk of death than in natives was also found in Middle Eastern migrants in Australia.[6] Risk factors for this cancer remain unclear; it is certainly related to the frequency of gallstones,[17] and hence to obesity.

Bladder Cancer

Compared to natives, an increased risk of mortality from this cancer is observed only for Algerian male migrants. The association between squamous cell carcinoma of the bladder and urinary schistosomiasis is well known.[18] This disease is endemic in some parts of North Africa, being prevalent in Egypt, but also in some parts of Algeria. Since the higher risk in the Algerian population is limited to males, professional exposure to some bladder carcinogens may be involved. Stratified analysis by age and social class shows that the elevated risk of death from this cancer is limited to Algerian migrants in the oldest age groups for whom occupational activity is unknown (most of them are classified as retired). The relevant occupational exposures in this age group would have occurred during the 1960s (i.e. in rubber industry, painting).

Breast and Genital Cancer

Breast cancer is more frequent in France (estimated age-standardized incidence rate (ASR: $56.2/10^5$)[16] than in Maghrebian countries (ASR in Setif: $6.4/10^5$),[1] and all Maghrebian migrants have lower mortality risks than natives. Reproductive behaviour differs greatly between Maghrebians and the French. Although the fertility of Maghrebian women has decreased greatly from an average of 8.9 children in 1968 to 5.0 in 1982, it remains twice as high as among the natives.[19]

Maghrebian countries appear to be a high risk area for cervix cancer; it is the most frequent cancer in women in the Setif cancer registry in Algeria[1] as well as in hospital series in Tunisia[2] and Morocco.[3] In part, this high relative frequency is due to the low incidence of breast cancer, as the ASR for cervix cancer in Setif is in fact quite similar to that observed in the French cancer registries.[16] Compared to natives, Algerian and Tunisian migrant women have an unexplained lower risk of mortality for this cancer. This is unlikely to be due to greater screening of Maghrebian women, as it has been found that Maghrebian migrant women receive preventive medical advice half as frequently as French nationals.[15]

Other Cancers

The world area with the highest mortality from lymphoma is Northern Africa.[20] Compared to natives, Egyptian migrants have a higher risk of death from lymphoma (significantly so for non-Hodgkin's lymphoma) in males. This was not observed in other North African migrants in France, nor amongst Egyptian migrants in Israel.[4] The highest incidence rates among migrants in Australia are seen among Egyptian migrant males, although compared to natives the standardized incidence ratio was not significant.[5]

CONCLUSION

Despite possible biases and limitations of this study (particularly with respect to the non-homogenous nature of the migrant populations), the findings presented in this paper provide the first available mortality data on cancer patterns among the large Maghrebian migrant populations in France. Traditional habits related to Islam or to other cultural factors may explain many of the specific cancer patterns observed in these migrants.

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