

Influence of rural environment on diagnosis, treatment, and prognosis of colorectal cancer

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Abstract

Study objective—Several studies have shown that residential location (urban or rural) influences the incidence of colorectal cancer. The aim was to investigate the influence of rural environment on colorectal cancer history and survival in a well defined population.

Design—Patients with colorectal cancer diagnosed in the department of Calvados (France) were classified by place of residence (urban/rural) and information on clinical symptoms, tumour extension, treatment, and survival was collected.

Setting—The study was population based, in the department of Calvados in France.

Patients—During 1978-1984, 1445 colorectal cancers were collected by the Digestive Tract Cancer Registry of Calvados, 1047 with an urban place of residence (544 males and 503 females) and 284 with a rural place of residence (134 males and 150 females).

Measurements and main results—In both sexes, rural patients with colorectal cancers were treated less frequently in a specialised health care centre (40.0%) than patients from an urban population (53.4%). The difference was mainly but not entirely explained by distance from the specialised health care centre. In females in the rural population, cancers were diagnosed more frequently at the stage of severe clinical symptoms (22.1%) and metastases (18.8%) than they were in the urban population (15.5% and 12.3%). In addition among females a rural environment appeared to confer a worse prognosis (relative risk = 1.3).

Conclusions—Our findings suggest an inequality between rural and urban populations, especially for women. The loneliness of rural women leads to a delay in diagnosis and worse survival. In health education campaigns on colorectal cancer, efforts must be made to provide medical information to rural women in order to reduce the delay in diagnosis and improve survival.

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Several studies provide evidence of a higher incidence of colorectal cancer in urban areas compared with rural areas,¹⁻⁵ but none provides information about the ultimate influence of the rural environment on the natural history of colorectal cancer and on survival from this disease.

Nevertheless, such information is important in planning the prevention and treatment of colorectal cancer. The aim of this study was to investigate the influence of the rural environment on diagnosis, treatment, and prognosis of colorectal cancer in a well defined population in the department of Calvados (France).

Methods

The present study is based on data from the Digestive Tract Cancer Registry set up for the department of Calvados. During 1978-1984, 1445 colorectal cancers were diagnosed, 731 males and 714 females.

For every case, information was recorded for sex, age, place of residence using the urban category of "Zone de Peuplement industriel ou urbain" (ZPIU),^{6,7} occurrence of severe clinical symptoms (obstruction and perforation), tumour extension (intramural infiltration, lymph node involvement and metastases), anatomical subsite (proximal colon, distal colon or rectum), type of treatment (none, palliative surgery, curative surgery), and place of treatment (specialised university hospital or cancer institute, and non-specialised general hospitals or private clinics). In the department of Calvados, the specialised health care centres are situated in the city of Caen. Consequently, within the entire urban population, the inhabitants of Caen were studied as a subset. Information on survival was obtained for 92% of the population. The study was conducted among a final population of 678 males (544 urban and 134 rural) and 653 females (503 urban and 150 rural). Table I shows that the distribution of anatomical subsite by residential location was similar in the two sexes.

Statistical analysis was conducted using the χ^2 test, Student's *t* test, and the Mantel-Haenszel adjustment method. Cox's model in BMDP2L was used for analysis of survival data.

Results

DIAGNOSIS

For males, the mean age at diagnosis, the frequency of severe clinical symptoms, and local and distant tumour extension were similar (tables I and II). For females, mean age at diagnosis did not differ (table I). Metastases were more common in the rural population (18.8 versus 12.3) ($p < 0.05$). Severe clinical symptoms were also more common in the rural population (22.1% versus 15.5%) ($p < 0.05$) (table II), but after controlling for metastases, symptomatology was similar in the two populations.

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TREATMENT

In both sexes, frequencies of different treatments were similar. Inhabitants of rural areas were less frequently treated in specialised centres (45.1% of males and 35.2% of females) than urban inhabitants (55.0% of males and 51.7% of females) especially among women (table III), and the difference was still significant after controlling for symptomatology ($p < 0.01$), or for distant tumour extension ($p < 0.001$). Among the urban population, inhabitants of Caen were still more often treated in specialised centres than other urban populations (fig 1). The difference was significant in males (62.1% versus 53.2%) ($p < 0.02$) and in females (65.2% versus 45.2%) ($p < 10^{-4}$). The rural population was less often treated in specialised institutions than the urban population

Table I Distribution of anatomical subsite of tumour according to residential location

	Urban		Rural		Percent
	n	Percent	n	Percent	
	<i>Males</i>				
Proximal colon	95	17.4	26		19.1
Distal colon	166	30.5	30		22.4
Rectum	283	52.0	78		58.2
Total	544		134		
	<i>Females</i>				
Proximal colon	150	29.9	42		28.0
Distal colon	131	26.0	44		29.3
Rectum	222	44.1	64		42.7
Total	503		150		

There were no significant differences between urban and rural for any cancer

Table II Comparison of mean age to residential location

	Urban			Rural			p
	n	Mean age	SD	n	Mean age	sd	
Males	544	67.1	11.0	134	67.7	11.0	NS
Females	503	68.4	13.1	150	70.0	12.3	NS

Table III Comparison of condition at diagnosis in urban and rural populations

	Urban (n=544)		Rural (n=134)		p
	n	Percent	n	Percent	
	<i>Males</i>				
Mean age (years, ≤ 70)	320	58.8	68	50.7	NS
Severe clinical symptoms	64	11.9	18	13.4	NS
Tumour extension					
Serosa free of cancer	129	23.7	31	22.9	NS
Positive nodes	177	32.5	46	34.3	NS
Metastases	100	18.4	23	17.2	NS
	<i>Females</i>				
Mean age (years, ≤ 70)	246	48.8	68	45.6	NS
Severe clinical symptoms	78	15.5	3	22.1	<0.05
Tumour extension					
Serosa free of cancer	100	19.8	32	21.4	NS
Positive nodes	172	34.3	42	28.2	NS
Metastases	62	12.3	22	18.8	<0.05

Table IV Comparison of treatment in urban and rural populations

	Urban		Rural		p
	n	Percent	n	Percent	
	<i>Males</i>				
Place of treatment					
Unknown	19		1		
Specialised	289	55.0	60	45.1	<0.05
Treatment					
No surgery	20	3.7	6	4.5	NS
Palliative surgery	140	25.7	30	22.4	NS
Curative surgery	384	70.6	98	73.1	NS
	<i>Females</i>				
Place of treatment					
Unknown	10		8		
Specialised	255	51.7	50	35.2	<0.001
Treatment					
No surgery	18	3.6	11	7.4	NS
Palliative surgery	120	23.8	40	26.8	NS
Curative surgery	365	72.6	99	65.8	NS

excluding Caen. The difference was significant in males (43.3% versus 53.2%) ($p < 0.05$) and in females (35.4% versus 45.2%) ($p < 0.05$).

SURVIVAL

Among males, there was no difference in survival between urban and rural populations. Among females, a rural place of residence was a poor prognostic factor (relative risk=1.3). The five year survival rate was 40% in urban and 30.7% in the rural population (fig 2). A monofactorial analysis of prognostic factors was conducted among 653 females: age, severe clinical symptoms, tumour extension, and type of treatment were the other prognostic factors (table IV). The place of treatment had no influence on survival. Since severe clinical symptoms and metastases were more common in rural women, the effect of the environment was tested after controlling for these variables and it was still significant ($p < 0.05$), even after controlling for age ($p < 0.08$). But in a model including age, tumour extension, symptoms, and type of treatment, the environment no longer had an effect (tables V and VI).

Discussion

Our data provide evidence that colorectal cancer, especially among women, is different in urban and in rural areas from the point of view of diagnosis, treatment, and survival. Among women living in rural areas, cancer was diagnosed more frequently with severe clinical symptoms (obstructions, perforation) and with metastases. However, the distribution of anatomical sites was similar in urban and rural women. Thus such findings strongly suggest a delay in diagnosis for women in a rural environment. This delay has been established in both sexes by several studies,^{8,9} and could be explained in part by a false interpretation of symptoms such as constipation or rectal bleed-

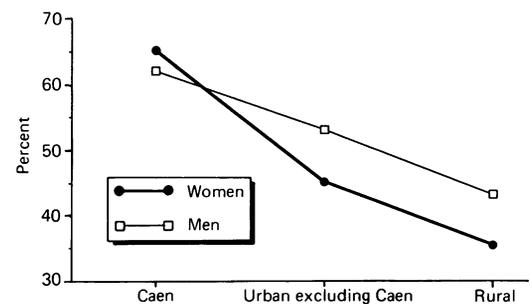


Figure 1 Percentage treated in a specialised centre in the different populations.

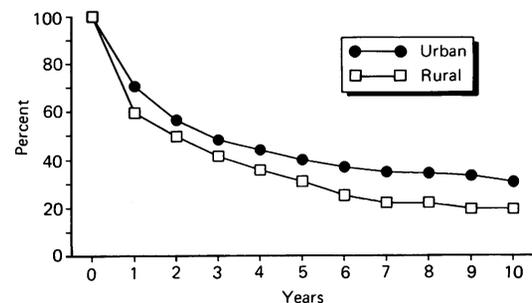


Figure 2 Influence of environment on actuarial survival among women.

ing.⁹ The contribution of this report is to demonstrate such a delay only in women.

In both sexes, cancers occurring in the rural population in France are less frequently treated in specialised centres. Such a difference has been found in several studies for other diseases. In our report, this phenomenon was more important among women. In the department of Calvados, all specialised health care centres are situated in the town of Caen. So, to distinguish the effect of the distance from these centres from the effect of the type of centre, the urban population was divided in inhabitants of Caen and others. Distance from specialised health care centres could certainly explain a part of the less frequent use of these centres, especially among women (fig 1). Nevertheless, the remaining significant difference between the "urban population excluding Caen" and the rural population suggests that distance alone is not enough to explain the less frequent use of specialised centres by the rural population.

The most important result of the present study is the adverse effect of rural residence on survival in women. Our analysis shows that this effect was not due to the place of treatment, but was explained in part by the delay in diagnosis (symptoms and tumour stage) and in part by the type of treatment, although the difference in the type of treatment between the urban and rural populations was not significant (table III). To our knowledge, this effect of rural environment has not yet been reported by any other colorectal cancer survival study, nor by other European population based studies.^{10 11} However, Bouvier-

Colle and colleagues^{12 13} showed an excess mortality in rural areas for all causes of death in France after taking into account age distribution and socioprofessional categories. It would be interesting to test the prognostic value of rural environment in other population based studies and for other carcinomas.

Our findings suggest an inequality between a rural and an urban population, especially for women. The loneliness of rural women leads to a delay at diagnosis and worse survival. In health education campaigns on colorectal cancer, efforts must be made to provide medical information to rural women in order to reduce the delay in diagnosis and improve survival.

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Table V Monofactorial analysis of prognostic factors of colorectal cancer among females (n = 653)

	Relative risk	p
Tumour extension		
Serosal invasion	2.7	<10 ⁻⁴
Nodal invasion	2.2	<10 ⁻⁴
Metastases	3.7	<10 ⁻⁴
Curative surgery	1.7	<10 ⁻⁴
Age	2.0	<10 ⁻⁴
Symptomatology	1.8	<10 ⁻³
Environment	1.3	<0.02
Place of treatment	-	NS

Table VI Multifactorial analysis of prognostic factors of colorectal cancer among females (n = 526)

	Step 0	Final model
Tumour extension	<10 ⁻⁴	<10 ⁻³
Curative surgery	<10 ⁻⁴	<10 ⁻²
Age	<10 ⁻⁴	<10 ⁻³
Symptomatology	<10 ⁻³	<10 ⁻²
Environment	<0.02	p=0.13
Place of treatment	NS	-

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