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Urban-rural differences in male cancer incidence and mortality in the Umbria region of Italy

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Abstract

Background: The aim of this study is to verify the existence of different rates of cancer incidence and mortality in males in the urban and rural populations of Umbria and to formulate hypotheses as to why this occurs.

Methods: Directly age-adjusted incidence rates (AAIR) and age-adjusted death rates (AADR) were calculated for 1998-2002 and the expected number of rural cases (standardized incidence ratios-SIRs and standardized mortality ratios-SMRs) was determined by indirect standardization using urban incidence and mortality.

Results: Urban zones have higher AAIR's for the most common cancer sites. Significantly lower SIRs, in rural areas, were shown for skin melanoma, prostate and bladder cancers and a significantly lower SIR was also determined for the combination of all cancer sites. Lower AADRs in rural areas were demonstrated for the most common cancer sites and significant low SMRs were shown for lung cancer and skin melanoma. Prostate cancer incidence is significantly higher in urban areas whereas the mortality rate is slightly higher in rural municipalities probably due to the effects of the opportunistic screening widely available in Umbria, particularly in zones near diagnostic services. A very similar pattern was found for urinary bladder cancer; this could be related to the association between prostate and bladder cancer sites. Both incidence and mortality from melanoma are significantly lower in rural areas, this may be due to the difficulty in accessing diagnostic services or/and to different occupational exposure patterns.

Conclusion: It would appear in Umbria that differences in health services utilization continue to exist. In particular, our results are compatible with a lower diffusion of preventive activities for prostate cancer and skin melanoma in rural areas.

Key words: urban-rural differences; cancer incidence; cancer mortality

Introduction

The analysis of urban-rural patterns for cancer incidence and mortality has for many years been carried out with the aim of emphasizing life-style differences, such as smoking and dietary habits, socioeconomic status and other exposures to risk factors [1-4]. Currently, lifestyle homogenization, particularly in developed Western European countries, and the increase in opportunities to relocate has lead to a more homogenous exposure to the most common risk factors. The differences in cancer incidence and mortality, along with exposure to different risk factors, depend on the ability to access health services, both diagnostic and therapeutic, as well as secondary prevention, such as mass screening programs [5-6].

In the Italian central region of Umbria, with a resident male population of 407,649 as at 01.01.2000, the main university oncology centres are located in the major cities of Perugia and Terni, with four minor oncology services available in other smaller towns. The region of Umbria covers an area of 8456 square kilometres with a population density of approximately 103 inhab/km^2. The distances by road between the two main oncology centers and the rest of the region's municipalities are small and it is therefore possible to hypothesize that there is equality in access to these public services.

The aim of this study is to verify the existence of differences in male cancer incidence and mortality in the urban and rural areas of Umbria and to hypothesize the underlying reasons should such differences exist, particularly in relation to access to health services.

Materials and methods

Incidence data, for the period 1998 to 2002 were obtained from the Umbrian Population Cancer Registry (RTUP); the cases were collected, coded, stored and analyzed in accordance with the standard methods recommended for cancer registries [7-8]. All bladder cancers were considered malignant if not reported as not-infiltrating. Mortality data, for the same period, were supplied by the regional Nominative Causes of Death Registry, ReNCaM, based on the Umbrian municipalities Registry Population Offices and linked with the archives of death certificates collected by the Local Health Districts which are then used afterwards by ISTAT [9]. Incidence and mortality were coded according to the Tenth International Classification of Diseases [10].

The cancer sites examined are listed in table 1. For each site we calculated the directly age-adjusted incidence (AAIR) and mortality (AADR) rates per 100,000 inhabitants, with relative s.e.; the Umbria population from the 1991 census was used as the standard, aiming to reduce the bias due to the exceeding difference in age structure.

The expected number of rural cases was obtained from indirect standardization using as the standard the urban incidence and mortality rates of several cancer sites. The significance of the observed/expected ratios (SIRs for incidence and SMRs for mortality) and the corresponding 95% confidence intervals were based on the Poisson distribution [11].

Urbanization levels were established following the classification of the Italian Institute of Statistics [12], based on the number of inhabitants and population density. Eighteen urban municipalities were considered, with an overall male population of 288,336; 74 rural municipalities were used with a population of 119,313 males.

Results

Table 1 reports the incidence data relative to urban and rural municipalities. The most common cancer sites such as stomach, colon-rectum, liver, lung, skin melanoma, prostate, kidney and bladder, had higher AAIRs in the urban zones. Significant low SIRs, in rural areas, were shown for skin melanoma (SIR=0.68, 95% C.I.=0.50-0.87), prostate (SIR=0.90, 95% C.I.=0.83-0.97) and urinary bladder (SIR=0.82, 95% C.I.=0.74-0.89) cancers; the combination of all cancer sites showed a significant lower SIR (SIR=0.95, 95% C.I.=0.92-0.98). In figure 1, illustrating the incidence curves by age, relative to four sites with a significant SIR, it is shown that the lower rates concern those aged greater than 70, with the exception of the rate of skin melanoma which concerns all age groups.

The pattern for mortality was more variable (table2). Lower AADRs in rural areas were demonstrated for colorectal cancers, lung, skin melanomas and non melanomas, bladder, brain, leukaemias and all combined cancers. Significant low SMRs were shown only for lung cancer (SMR=0.89, 95% C.I.=0.81-0.97) and skin melanoma (SMR=0.41, 95% C.I.=0.20-0.62). Figure 2 shows that the difference in SMR relative to lung cancer is derived from the lower rates in older males, whereas, with respect to incidence, the rural mortality curve for skin melanoma is lower for most of the age groups.

Discussion

Our results highlight some of the organisational features of the public health services in the Umbria region and, in part, some of the main risk factors.

The higher incidence and mortality from lung cancer in urban areas was often related to smoking habits even though some studies have demonstrated an excess of cases in urban areas after controlling for smoking behaviour [13]. Possible explanations include variations in

Table 1. Incidence, per 100,000 inhabitants, for the most common cancer sites in the urban and rural zones of Umbria. Males, 1998-2002.

		urban AAIR	s.e	rural AAIR	s.e.	rural obs/exp	SIR	*95% C.I.*
C16	Stomach	55.0	*4.4*	54.3	*6.5*	363/368	0.99	*0.89-1.09*
C18-C21	Colon-rectum	104.4	*6.1*	102.5	*9.0*	661/692	0.96	*0.88-1.03*
C22	Liver	22.3	*2.8*	19.5	*3.9*	127/145	0.85	*0.71-1.00*
C25	Pancreas	15.8	*2.4*	17.2	*3.7*	113/101	1.12	*0.93-1.33*
C33-C34	Lung	102.4	*6.0*	99.1	*8.9*	637/678	0.94	*0.87-1.01*
C43	Skin melanoma	11.2	*2.0*	7.5	*2.5*	47/69	0.68	*0.50-0.87*
C44	Skin non melanoma	109.9	*6.2*	115.2	*9.4*	768/736	1.04	*0.97-1.12*
C61	Prostate	110.4	*6.2*	99.5	*8.7*	669/774	0.90	*0.83-0.97*
C64	Kidney	23.9	*2.9*	21.4	*4.2*	135/155	0.87	*0.73-1.02*
C67	Bladder	80.4	*5.3*	68.4	*7.4*	436/534	0.82	*0.74-0.89*
C71	Brain	10.4	*1.9*	10.9	*3.0*	69/65	1.06	*0.83-1.31*
C82-C85	Lymphoma	13.5	*2.2*	14.3	*3.4*	89/87	1.02	*0.82-1.23*
C91-C95	Leukaemia	18.8	*2.6*	21.1	*4.2*	134/122	1.10	*0.92-1.28*
C00-C96	All sites	773.2	*16.4*	747.6	*24.0*	4863/5115	0.95	*0.92-0.98*

Figure 1. Incidence per 100,000 inhabitants by age of sites with significant SIR, in urban and rural zones of Umbria. Males, 1998-2002.

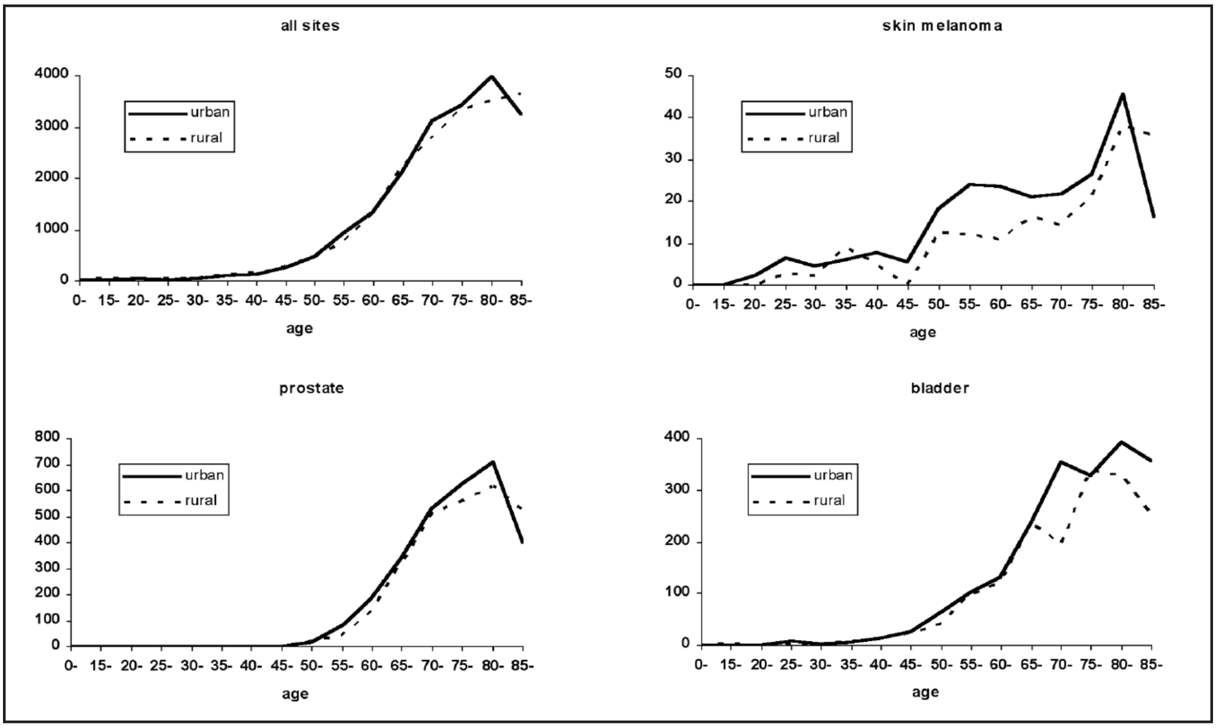
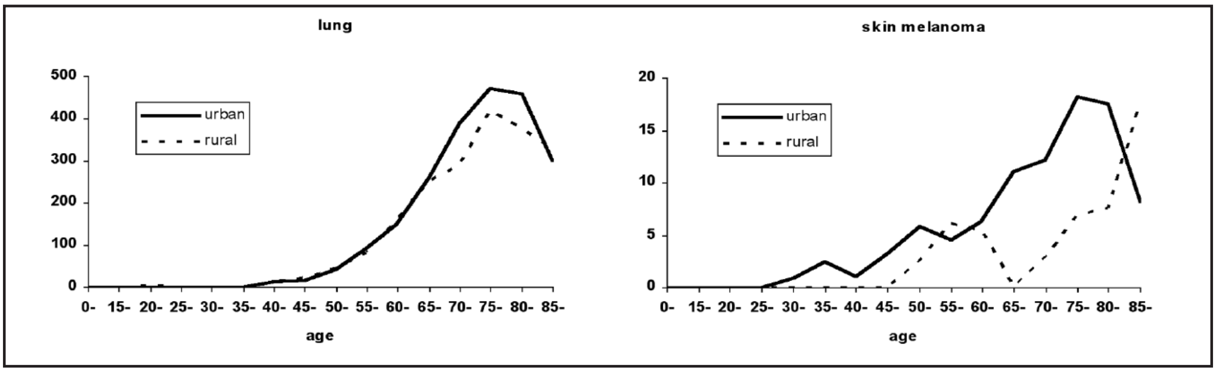


Table 2. Mortality, per 100,000 inhabitants, for the most common cancer sites in urban and rural zones of Umbria. Males, 1998-2002.

		urban AADR	*s.e*	rural AADR	*s.e.*	rural obs/exp	SMR	*95% C.I.*
C16	Stomach	34.4	*3.4*	36.7	*5.3*	247/236	1.05	*0.92-1.18*
C18-C21	Colon-rectum	41.6	*3.9*	41.5	*5.9*	276/284	0.97	*0.86-1.09*
C22	Liver	16.0	*2.4*	17.0	*3.6*	112/108	1.04	*0.86-1.23*
C25	Pancreas	14.3	*2.3*	16.5	*3.6*	109/93	1.18	*0.97-1.40*
C33-C34	Lung	88.0	*5.5*	80.2	*8.0*	522/587	0.89	*0.81-0.97*
C43	Skin melanoma	4.1	*1.2*	1.7	*1.2*	11/27	0.41	*0.20-0.62*
C44	Skin non melanoma	1.2	*0.6*	0.8	*0.8*	6/8	0.73	*0.26-1.14*
C61	Prostate	34.8	*3.5*	36.2	*5.2*	253/246	1.03	*0.90-1.15*
C64	Kidney	7.1	*1.6*	7.8	*2.5*	51/48	1.07	*0.80-1.35*
C67	Bladder	19.9	*2.6*	17.8	*3.7*	118/140	0.82	*0.70-1.00*
C71	Brain	9.1	*1.8*	8.6	*2.7*	53/27	0.94	*0.70-1.18*
C82-C85	Lymphoma	7.9	*1.6*	9.4	*2.8*	60/52	1.17	*0.89-1.45*
C91-C95	Leukaemia	14.5	*2.3*	13.2	*3.2*	90/100	0.90	*0.72-1.08*
C00-C96	All sites	352.9	*11.1*	348.7	*16.5*	2319/2389	0.97	*0.93-1.01*

Figure 2. Mortality per 100,000 inhabitants by age of sites with significant SMR, in urban and rural zones of Umbria. Males, 1998-2002.



exposure to air pollution, occupational differences and the legacy of selective migration between urban and rural areas [14]. Our data show, in rural areas, lower rates both in incidence (no-significant SIR, C.I.=0.87-1.01) and mortality (significant SMR) suggesting that these effects also exist in Umbria.

Stattin P. et al. demonstrated that prostate cancer incidence was mainly higher in urban regions of Sweden and in counties with university hospitals, which was probably also due to better cancer screening [15]. Ocaña-Riola et al. report a significantly high relative risk associated to urbanization and low RR in relation to illiteracy [16]. In our study the prostate cancer incidence is significantly higher in urban areas whereas the mortality rate is similar in rural municipalities. This is probably due to the effects of PSA opportunistic screening, which is widespread in Umbria, particularly in zones close to diagnostic services [17].

A very similar pattern was found for urinary bladder cancer, this may be due to the association between the two sites [18-20], due to the fact that during the diagnosis of cancer several examinations are performed in order to evaluate its behaviour and extension; such examinations may also detect the prevalence of other silent cases. In particular, prostate and bladder synchronous simultaneous cancer are found in cystectomies performed for bladder carcinomas: in several studies, older patients undergoing radical cystectomy due to bladder cancer usually also showed an incidental finding of prostate cancer [21]. Moreover a common pathway of carcinogenesis related to urinary stasis, chronic inflammatory attacks, genetic mutations and others besides those induced from irradiation exists [19].

In our study, both incidence and mortality from skin melanoma are significantly lower in rural areas, and these differences were demonstrated across all age groups. Several authors have found a positive association between sun exposure that is intermittent and an inverse association to more continuously high exposure to the sun [22-24]. People living in urban areas may get more intermittent exposure to the sun, whereas residents in more rural areas may have a more constant high exposure, but protect themselves from the exposure [25]. Another reason could relate to the early diagnosis activities that may be more readily available in urban areas as opposed those more rural [25]. It is probable that in urban areas the number of melanomas diagnosed is higher than in rural areas and this results in higher incidence and mortality levels.

In conclusion it seems that in Umbria, differences in the use of health services exist. In particular, in rural areas access to secondary prevention practices for prostate cancer and cutaneous melanoma is sometimes lacking, in any case these services are not provided and organized as mass-screening programmes by the Regional Health Department.

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