

Epidemiological overview on the effectiveness of mass screening for female cancer in Umbria, Italy

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Summary

Using incidence, survival and mortality we tried to verify the effectiveness of mass-screening interventions for cervical uterine, breast, and colorectal cancer in females.

Mortality data concern the period from 1978-2002. Incident cases derived from an *ad hoc* survey for 1978-1982 data and from the RTUP from 01/01/1994 to 31/12/2002. Relative survival rates were calculated for 1978-1982, 1994-1997 and 1998-2002 time intervals.

All standardized mortality figures showed a steady trend. Incidence rates concerning cervical uterine cancer showed a decrease starting from the 1978-1982 period, whereas those for breast cancer had a constant increasing trend, and those for colorectal cancer increased up to 1997-1999 and later remained constant.

For breast cancer the 5-year survival rate increased about 15% compared to the first period, for colon cancer there was less of an increase and the increase for cervical uterine cancer survival was only for the 1998-2002 period compared to the former ones.

With constant incidence rates, improvement in survival from cervical uterine cancer may be due to a high number of cancer cases detected at an early stage. The effect of breast cancer screening on incidence is evident, though differences still did not influence mortality and survival. Colorectal cancer epidemiology can be considered as a prescreening pattern. Mortality, incidence and survival data allow a good overview for the effectiveness of screening procedures.

Key words: Female cancers; Screening; Incidence; Mortality; Survival.

Introduction

Cancer is an important public health problem, and is one of the commonest causes of premature and avoidable death in Europe [1, 2] and in Italy [3, 4]. Consequently the European Code Against Cancer was introduced as a series of recommendations which, if followed, could lead in many instances to a reduction in cancer incidence and also to reductions in cancer mortality, as “women from 25 years of age should participate in cervical screening”; “women from 50 years of age should participate in breast screening”; “men and women from 50 years of age should participate in colorectal screening” [5]. Screening is a term frequently applied to the situation where tests are used to indicate whether an (generally asymptomatic) individual is at a high or low risk of having cancer. Detecting cancers at an early, asymptomatic stage could lead to a decrease in the mortality rate for certain cancers. The first large-scale clinical trial to demonstrate the efficacy of mammographic screening was the Health Insurance Plan (HIP) in New York [6], followed by the Two-County study in Sweden [7]; still today screening does save lives [8]. There is sufficient non-experimental evidence showing the efficacy of screening for cervical cancer using a cervical smear (Pap) test performed every three to five years and offered to all women over 25 years

of age [9, 10]. Human papillomavirus testing for primary cervical cancer screening is still under discussion [11]. Colorectal cancer screening is both efficacious and cost-effective compared with no screening [12, 13].

Currently in Umbria, a region of central Italy with 443,795 resident women as of 01/01/2005, mass screening was implemented by the Health Department of the regional government for cervical uterine, breast and colorectal cancers. Screening has been proposed since the 1980s to Umbrian women aged 25-64 and at present covers most of the targeted female population. Screening for the early detection of breast cancer was introduced in the early 1990s on a voluntary basis, and in the late 1990s as active mass screening for females aged 50-69. The procedure was first started only in some local health districts and actually covered over 60% of the target population in the region. Colorectal cancer screening started in 2006 for people aged 50-74 and clearly it is not yet possible to estimate the compliance. An incomputable share of the population still takes advantage of voluntary screening.

A regional cancer registry, the Umbrian Population Cancer Registry (RTUP), was established in the early 1990s, therefore data on incidence and survival are available for the period 1994-2002. Furthermore for the 1978-1982 period, an *ad hoc* survey was carried out in the region to find out cancer incidence [14, 15]. Using incidence, survival and mortality data recorded in our databases, we tried to verify the effectiveness of those pre-

ventive actions, taking into account that cervical uterine cancer screening has been widespread for almost the total target population for several years, while breast cancer screening is presently still unapplied in some regional areas and screening of colorectal cancer is still undergoing implementation.

Materials and Methods

Mortality data were supplied by the National Institute of Statistics (ISTAT) from 1978 until 1993, whereas for the subsequent 1994-2002 period, data were supplied by the regional Nominative Causes of Death Registry, ReNCaM, based on the Registry Population Offices of the Umbrian municipalities linked with death certificates collected by local health districts and later used for national surveys by ISTAT. No major or systematic difference seems to appear comparing ISTAT and ReNCaM-based mortality data, and since ReNCaM data are more readily available than ISTAT mortality data, they allow the inclusion of more recent years in the analysis. Causes of death were classified according to the 10th International Classification of Diseases (WHO, 1992) [16]: breast cancer as C50, colorectal cancer as C18-C21, cervix uteri cancer as C53.

Incident cases considered were taken from the Umbrian Population Cancer Registry database, recorded from 01/01/1994 to 31/12/2002. All cases were collected, coded, stored and analyzed in accordance with standard methods recommended for cancer registries [17], using the ICD X [16]. Incidence rates referring to the 1978-1982 period relate to cases resulting from the *ad hoc* survey carried out in the 1980s [15].

Age-adjustment, of both mortality and incidence rates, was made through a direct method using the population of Italian residents from the 1991 National Census Survey.

Relative survival rates were calculated according to the method proposed by Estève *et al.* [18,19]. The follow-up was 31/12/2004. Survival rates up to five years were calculated separately for three periods: 1978-1982, 1994-1997 and 1998-2002.

Results

Table 1 and Figure 1 show trends of mortality and incidence rates, dividing the 1978-2002 period into eight

three-year intervals. From 1983 to 1993 incidence data were not available.

All standardized mortality rates (AADR) showed a fairly steady trend: more recent rates (2000-2002) are very similar to those of the first period (1978-1982). Obviously crude rates, due to population aging, increase over time and the mean annual number of deaths varies from 124 to 180 for breast cancer and from 90 to 151 for colorectal cancer. Adjusted rates for cervical uterine cancer are very small, ranking from 0.7 to 2.1 per 100,000 inhabitants, and corresponding to a mean annual fatality figure of 12.

Both crude and age-adjusted incidence rates (AAIR) for cervical uterine cancer showed a decrease starting from the 1978-1982 period: from 1994 the rates showed very similar values (about 7.6 for standardized and 9.1 per 100,000 for crude rate). Also in the 1978-1982 interval the mean number of cases was 55 while, in the last period it was 39. Both crude and adjusted rates for breast cancer have a constant increasing trend. Over the examined time interval the standardized incidence rate increased by 45% and the crude rate by 71%. In the first period the mean annual number of cases was 367, while in the last it increased to 649. As for colorectal cancer, the incidence rate increased until the period 1997-1999 and later remained constant. In the 1978-1982 interval the mean annual number of cases was 176, while in the 2000-2002 3-year interval the figure went up to 360.

The curves by age for female breast cancer incidence showed an interesting trend: those relative to the first three periods practically increase in every age group compared to the former period; in the last period, the rate swiftly increases up to 69 years and then sharply decreases (Figure 2). The female colorectal cancer incidence rates by age, relative to 1994-2002, appreciably differ from those of the first period (1978-1982), but are very similar within themselves (Figure 2). The cervical uterine cancer corresponding curves are very uneven due to small values of age-incidence rates (Figure 2).

Table 1. — Crude and age-adjusted mortality and incidence rates for female breast, colorectal and cervical uterine cancer in the Umbria region.

Period		1978-1982	1982-1984	1985-1987	1988-1990	1991-1993	1994-1996	1997-1999	2000-2002	s.e.*
<i>Mortality</i>										
Age-adjusted rates	breast	27.7	26.2	28.3	30.5	29.7	30.5	28.1	28.8	1.2
	colon-rectum	20.3	20.8	19.5	22.7	21.2	20.8	23.0	20.9	1.2
	cervix	0.9	1.2	1.0	1.4	0.7	1.4	2.1	1.3	0.2
Crude rates	breast	30.0	28.2	32.2	36.0	37.8	40.0	39.6	42.1	1.6
	colon-rectum	21.9	22.4	23.2	28.8	29.5	31.2	36.9	35.2	1.5
	cervix	1.3	1.2	1.1	1.6	1.9	1.8	3.2	1.7	0.3
<i>Incidence</i>										
Age-adjusted rates	breast	85.2	—	—	—	—	97.6	112.4	123.3	2.9
	colon-rectum	38.9	—	—	—	—	50.6	58.8	56.1	1.8
	cervix	12.6	—	—	—	—	7.8	7.5	7.6	0.6
Crude rates	breast	89.0	—	—	—	—	119.4	139.8	152.1	3.3
	colon-rectum	42.6	—	—	—	—	71.1	84.2	84.1	2.5
	cervix	13.4	—	—	—	—	9.2	9.0	9.1	0.8

* Standard errors refer to 2000-2002 rates.

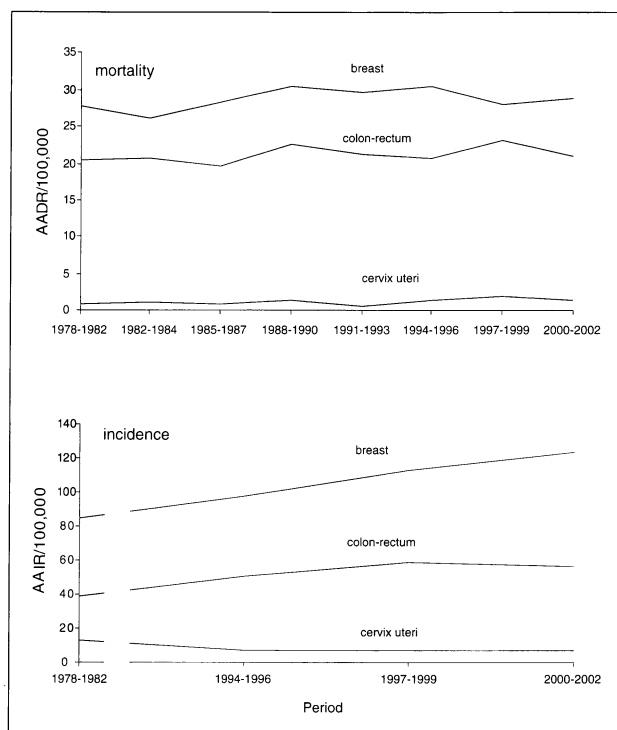


Figure 1. — Trend of age-adjusted mortality and incidence rates of female breast, colorectal and cervical uterine cancers in the Umbria region.

Table 2 and Figure 3 report relative survival rates of the three studied cancer sites. As far as breast cancer is concerned, the 5-year rate increased about 15% from the first period (71%) to the last one (86-87%). The 5-year survival rate for colon cancer shows a minor increase: about 5% from the first to the last period while a rise in cervical uterine cancer took place only during the 1998-2002 period with a 12% increase compared to former periods.

Table 2. — Relative survival for female breast, colorectal and uterine cervical cancers in the Umbria region.

	Periods	1978-1982	1994-1997	1998-2002	Lower	Upper
	years				95%	limits*
Breast	0	100.0	100.0	100.0	—	—
	1	92.1	97.3	98.2	97.6	98.7
	2	85.6	94.4	95.7	94.7	96.5
	3	80.1	90.9	93.4	92.2	94.4
	4	76.1	88.2	91.0	89.6	92.3
	5	71.3	86.1	86.9	85.0	88.5
Colon-rectum	0	100.0	100.0	100.0	—	—
	1	74.0	77.5	79.3	77.1	81.2
	2	65.0	68.6	70.0	67.6	72.3
	3	59.0	63.8	63.9	61.3	66.4
	4	55.0	61.2	61.7	59.0	64.3
	5	54.0	57.9	58.9	55.9	61.7
Cervix uteri	0	100.0	100.0	100.0	—	—
	1	88.7	85.3	92.7	87.0	96.0
	2	75.5	73.5	83.1	76.1	88.2
	3	68.1	67.1	79.8	72.2	85.6
	4	64.6	64.3	75.8	67.2	82.4
	5	63.0	63.7	75.8	66.1	83.1

* Confidence limits refer to 1998-2002 rates.

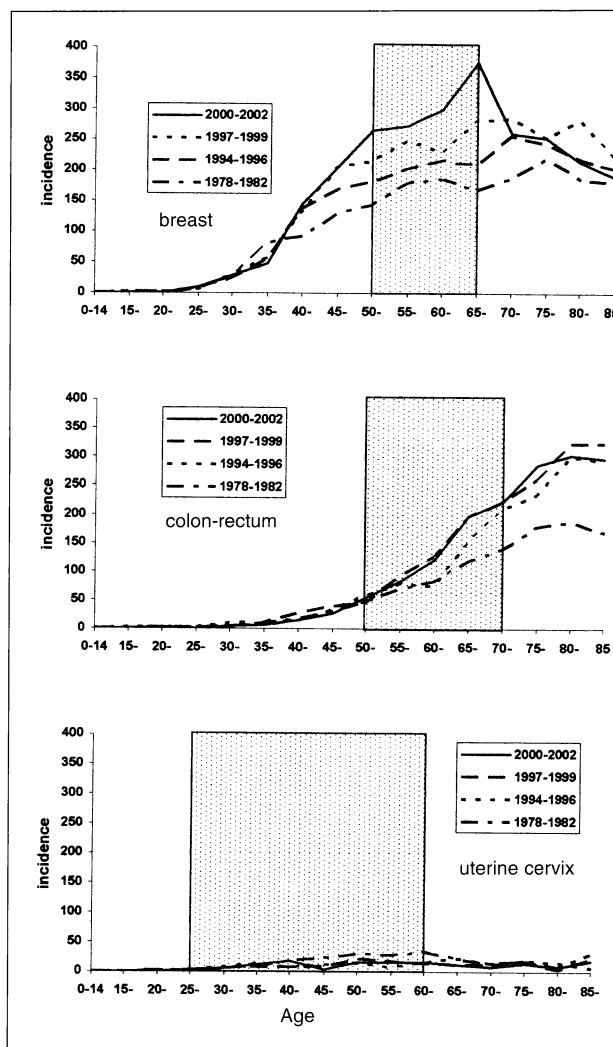


Figure 2. — Incidence of female breast, colorectal and cervical uterine cancer by age in the Umbrian region. Dotted area represents the target age group for mass screening.

Discussion

The trend analysis of several incidence and mortality rates for cervical uterine cancer is not easy to discuss. First of all, mortality rates depend on a variable proportion over time of deaths codified as unspecified uterine neoplasms [20]. In the Umbria region this rate varied from 10.4 per 100,000 inhabitants in the 1978-1982 period to 2.5 in the 2000-2002 interval. Nevertheless both cervical and uterine corpus cancer mortality rates remain practically constant [21]. As for uterine cervical cancer, in Italy and in many other European countries mortality and incidence trends are very similar [22, 23] and essentially depend on the adoption and use of screening programs that led to a reduction both in mortality and incidence [20, 21]. In Umbria, the improvement in prognosis is evident only for the last period, while there is an overlap of the first two curves, corresponding to a slight increase in mortality until 1999. This improvement, combined with constant incidence, could probably be due to

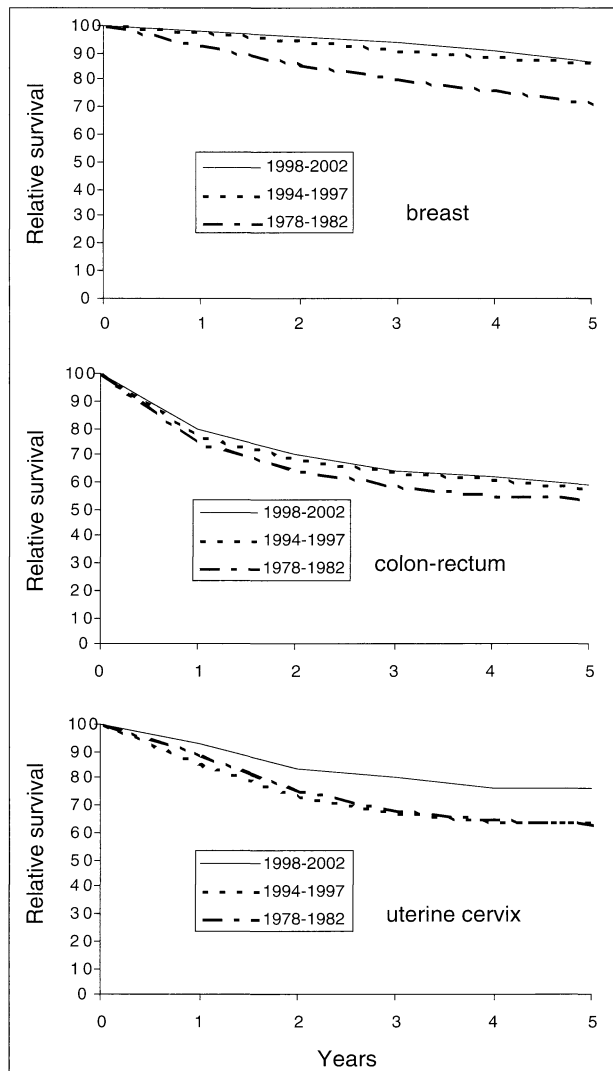


Figure 3. — Five-year relative survival for female breast, colorectal and cervical uterine cancer in the Umbria region.

a high number of cancer cases detected at an early stage, but the actual trend, also due to the small number of cases, remains unclear.

The effect of mammography screening on breast cancer incidence rate is evident when examining the corresponding curves even though in the 2000-2002 period less than 40% of the Umbrian target population was submitted to screening, and later the effects on mortality and survival rates are still not evident. In Italy, as in some other European countries, a favorable pattern was observed in breast cancer mortality which has to be attributed to earlier detection and improved treatment [24-27]. It is likely that, within some years, the positive effect of the increasing number of screened women will lead to further improvement in survival [28].

Colorectal cancer epidemiology can be considered as a prescreening pattern. Both incidence and mortality are quite stable, but the survival rate in the last ten years has

not been enhanced. In the past, Umbrian relative survival rates were among the highest in the Italian areas covered by cancer registries [29]. More recently the rate increase stopped, differently from other Italian zones and, in the last period, higher survival rates have been recorded by registries covering zones with active screening programs. In the Romagna region, Turin, Florence and in other areas survival rates had a relevant increase. The Umbrian survival figure nonetheless still ranks first among no-screening areas [30].

Conclusion

Mortality, incidence and survival data allow a good survey of the effectiveness of screening procedures, also considering that mortality and survival are influenced by several factors such as therapy, reconfiguration of services, increasing number of subspecialists, etc. The RTUP working group is planning efficacy monitoring taking into consideration other variables commonly used for this aim.

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