



Original Paper

Trends of *In Situ* Carcinoma of the Breast in Vaud, Switzerland

F. Levi,¹ V.-C. Te,¹ L. Randimbison¹ and C. La Vecchia²

¹Registre Vaudois des Tumeurs, Institut Universitaire de Médecine Sociale et Préventive, Centre Hospitalier Universitaire Vaudois, Falaises 1, 1011 Lausanne, Switzerland; and ²Istituto di Ricerche Farmacologiche “Mario Negri”, and Istituto di Statistica Medica e Biometria, Università degli Studi di Milano, Via Venezian 1, 20133 Milan, Italy

Time trends in incidence of *in situ* carcinoma of the breast over the period of 1977–1994 were analysed by histological type and age group, using data from the Cancer Registry of the Swiss Canton of Vaud, covering a population of approximately 295 000 women in 1990. Overall, 399 women with carcinoma *in situ* of the breast were registered. Age-adjusted (on the world population) incidence rates increased from 2.1/100 000 women in 1977–1979 to 9.4 in 1992–1994 (4.5-fold increase), and the rise was appreciably greater for ductal carcinoma *in situ* (DCIS, from 1.0 to 7.1/100 000) than for lobular carcinoma *in situ* (LCIS, from 1.0 to 2.3/100 000). The largest increase was registered between 1983 and 1992, whereas incidence rates tended to level off over the most recent calendar period. The upward trends were observed in all age groups above 40 years, but chiefly in the age groups 40–49 and 50–69, whose rates were higher than for women over the age of 70 years. These findings suggest that the adoption of mammography in this population during the 1980s is partly or largely responsible for the observed trends. Incidence rates of *in situ* breast carcinoma in Vaud are still significantly lower than those observed in the United States (between 15 and 17/100 000) over the same calendar period. This is attributable to a lower utilisation of mammography, but may also be related to real differences in the incidence of breast lesions in Europe compared to North America. © 1997 Elsevier Science Ltd.

Key words: breast neoplasms, ductal carcinoma *in situ*, lobular carcinoma *in situ*, non-invasive breast carcinomas, incidence, registries, screening

Eur J Cancer, Vol. 33, No. 6, pp. 903–906, 1997

INTRODUCTION

ALTHOUGH CARCINOMA *in situ* of the breast has been described since the 1930s, it has long been considered a rare disease [1, 2]. However, since the mid-1980s, a substantial rise in the incidence of carcinoma *in situ* of the breast has been observed in several areas of the United States covered by the Surveillance, Epidemiology and End Results (SEER) Program [3]. These include metropolitan Detroit [4], where age-standardised incidence rates for ductal carcinoma *in situ* (DCIS) increased from 0.8 to 6.5/100 000 black women and from 2.3 to 8.7/100 000

Caucasian women between 1975 and 1988. The rise was also observed, although to a more limited extent, for lobular carcinoma *in situ* (LCIS), whose age-standardised rates increased from 0.8 to 1.9/100 000 Black and from 1.0 to 2.8/100 000 Caucasian women. In Connecticut [5], the overall age-adjusted incidence rates increased from 4.2/100 000 in 1975–1979 to 17.5/100 000 in 1986–1990, most of the rise occurring since the early 1980s. The rise was observed in Caucasian and Black women, and separate analysis by age group and histology showed that the increase was present in all age groups above 40 years, and that the rise was mostly attributable to an increase in DCIS. Trends in incidence of DCIS between 1973 and 1992 were also analysed in the overall SEER dataset: overall, age-adjusted DCIS incidence rate increased over 5-fold from 2.4/100 000

Correspondence to F. Levi.

Received 12 Sep. 1996; revised 28 Nov. 1996; accepted 15 Jan. 1997.

in 1973 to 15.8 in 1992, most of the rise being observed in those above the age of 40 years and from the early 1980s onwards [3, 5].

These trends have been generally attributed to the widespread adoption of mammography in women aged 40 years and over, and debated within the framework of cost/benefit analysis for mammographic screening [6].

Few population-based data on incidence trends of carcinoma *in situ* of the breast by age and histological type are available from Europe. Nab and associates [7] reported 91 primary DCIS from the Eindhoven Cancer Registry, and an age-standardised incidence rate rising from 0.2/100 000 in 1975–1976 to 2.1 in 1988–1989.

To provide further information on the issue, we have therefore considered incidence data from the cancer Registry of the Swiss Canton of Vaud, where uniform criteria for classification and registration of carcinoma *in situ* of the breast were adopted from 1977 onwards.

MATERIALS AND METHODS

Breast cancer incidence data for the period of 1977–1994 were abstracted from the population-based Vaud Cancer Registry file, which includes data concerning incident cases of malignant and *in situ* neoplasms in the Canton (whose population according to the Census 1990 was approximately 295 000 women) [8].

Information collected by the register includes general demographic characteristics of the patient (age, sex, municipality of residence), site and histological type of the tumour according to the standard International Classification of Diseases for Oncology [9], and time of diagnostic confirmation.

The present series comprises 399 new histologically confirmed *in situ* female breast carcinomas (ICDO-T: 174.0–.9; 5th digit ICD-O-M: 2), including three morphological groups (ductal, lobular, unspecified *in situ* carcinoma).

Age-standardised (on the world standard population; [10]) incidence rates were computed by the direct method

in six triennial calendar periods (from 1977–1979 to 1992–1994), in the population of all ages and for four separate age strata (0–39, 40–49, 50–69 and 70 years and over). For comparative purposes with SEER data [3, 5], rates were also adjusted to the 1970 U.S. population.

RESULTS

Table 1 gives the numbers of registered cases and the corresponding age-standardised incidence rates for DCIS, LCIS and other carcinomas *in situ* of the breast between 1977 and 1994. Overall, 399 women with carcinoma *in situ* of the breast were registered. Incidence rates increased from 2.1 in 1977–1979 to 9.4/100 000 women in 1992–1994 (4.5-fold increase), and the rise was appreciably greater for DCIS (from 1.0 to 7.1, 7.1-fold increase) than for LCIS (from 1.0 to 2.3, 2.3-fold increase). The rise was highly significant ($P < 0.001$). The largest increase was registered between 1983 and 1991, whereas rates tended to level off over the most recent calendar period. The ratio between *in situ* and invasive carcinomas of the breast has increased by over 3-fold, from 3.4% in 1977–1979 to 10.7% in 1992–1994 (Table 1).

Corresponding age-specific trends are given in Figure 1 for all carcinomas *in situ*, and in Figure 2 for DCIS. While the pattern for LCIS was somewhat inconsistent, due to small absolute numbers, there was a rise restricted to women aged 40 years and over, and chiefly to those aged 40–49 and 50–69 years. Age-specific rates of DCIS were also subject to substantial random variation. Nonetheless, DCIS rates were higher at age 50–69 years than at 70 years or over from the mid-1980s onwards.

DISCUSSION

The present study confirms and quantifies, on the basis of European data, a substantial rise in diagnosis and registration of breast carcinoma *in situ*, mainly from the mid-1980s onwards. It also confirms that the rise was appreci-

Table 1. Number of cases (n) and age standardised (on world and U.S. 1970 census population) incidence rates per 100 000 women of carcinomas *in situ* (CIS) of the breast, by histological type (ductal, DCIS; lobular, LCIS; and total *in situ* carcinomas) and calendar period in Vaud, Switzerland, from 1977–1979 to 1992–1994

	DCIS		LCIS		Total CIS*		Ratio (%) CIS/ invasive carcinomas
	Rate (<i>n</i>)		Rate (<i>n</i>)		Rate (<i>n</i>)		
Period	World	U.S. 1970	World	U.S. 1970	World	U.S. 1970	
1977–1979	1.0(11)	1.1	1.0(9)	1.0	2.1(21) [1.3–3.0]*	2.2 [1.4–3.2]	3.4
1980–1982	2.2(24)	2.4	2.2(22)	2.2	4.5(47) [3.2–5.8]	4.8 [3.3–6.5]	6.6
1983–1985	1.5(20)	1.8	1.7(18)	1.8	3.3(38) [2.3–4.5]	3.6 [2.5–5.0]	4.7
1986–1988	2.9(34)	3.2	1.8(19)	1.9	4.8(54) [4.2–5.5]	5.2 [4.5–6.0]	6.6
1989–1991	6.6(83)	7.3	3.0(36)	3.2	9.6(120) [8.0–11.5]	10.6 [8.7–12.8]	11.0
1992–1994	7.1(92)	7.9	2.3(26)	2.4	9.4(119) [7.7–11.1]	10.4 [8.5–12.4]	10.7

*Includes five *in situ* carcinomas of unspecified morphological type, diagnosed in 1977–1979, 1980–1982, 1986–1988, 1989–1991 and 1992–1994, respectively.

*95% confidence intervals, based on the Poisson distribution, are given in brackets.

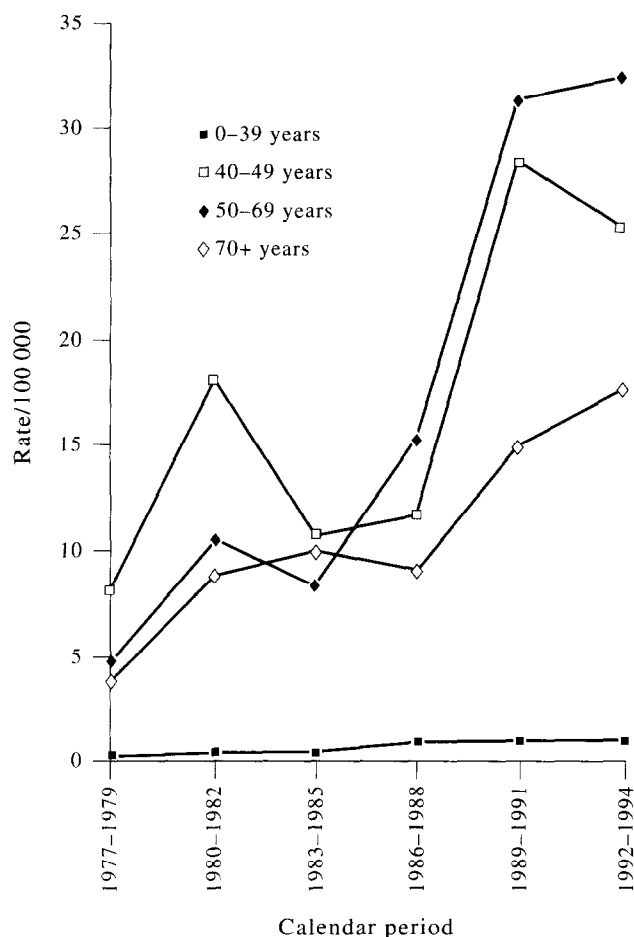


Figure 1. Trends in age-standardised (world population) incidence rates of all *in situ* carcinomas of the breast in four age groups in Vaud, Switzerland, from 1977-1979 to 1992-1994.

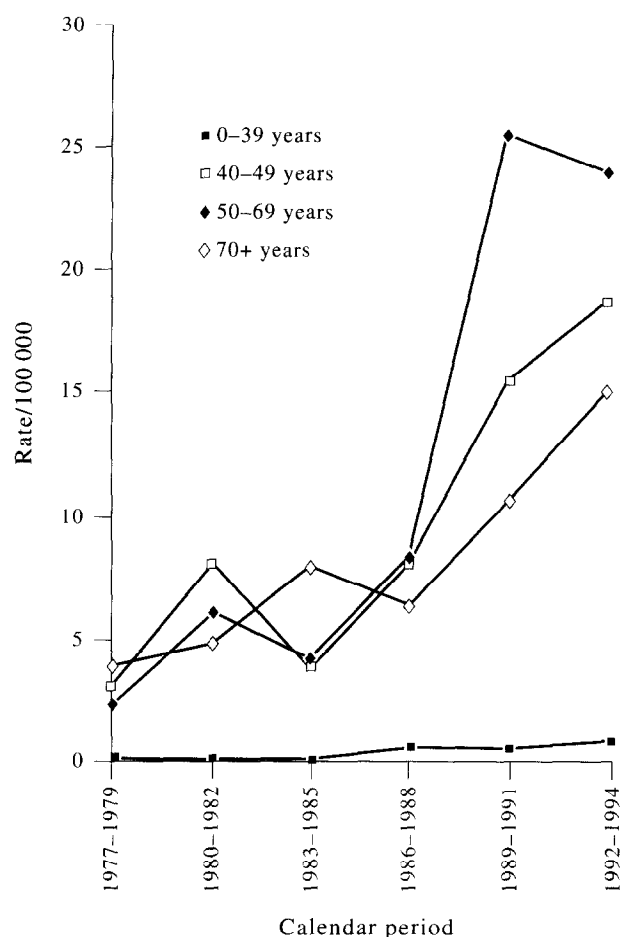


Figure 2. Trends in age-standardised (world population) incidence rates of ductal carcinoma *in situ* of the breast in four age groups in Vaud, Switzerland, from 1977-1979 to 1992-1994.

ably greater for DCIS, and observed in all age groups above 40 years, but chiefly between 40 and 69 years.

These findings are consistent with the hypothesis that mammography is partly or largely responsible for the observed trends [11]. The rises, in fact, were greater for the histotype (DCIS) which is generally of large size, associated with microcalcifications and is therefore more easily detectable by mammography [12-14]. The upward trends, moreover, were larger or restricted to the age groups where mammography has been more frequently adopted [15]. Furthermore, the largest increases were observed between 1982 and 1991, i.e. during the calendar period when mammography was gradually introduced in this Swiss population [16]. However, according to the 1992-1993 Swiss Health Survey [17], only one out of five women aged 50-64 years residing in the Canton of Vaud reported having experienced mammographic screening in the year preceding the interview, and a similar utilisation was reported in the age group 35-49 years. Between 1974 and 1993, breast cancer incidence in Vaud increased by 43% (from 60.0 to 85.5/100 000 females), but mortality by only 7% (from 21.4 to 22.8) [18].

The present registration data are unlikely to be affected by major sources of bias, since similar criteria of surveillance and registration have been adopted throughout the study

period, and the standardised and centralised criteria for pathological examination allowed utilisation of the same pathological classification. Thus, the upward incidence trends of cancer *in situ* of the breast observed are partly or largely attributable to increased diagnosis of the condition [2, 19].

Still, the overall age-adjusted *in situ* breast cancer incidence rate registered in 1992-1994 (10.4/100 000, standardised on the 1970 U.S. population, with 95% confidence interval between 8.5 and 12.4) in the Vaud population is significantly lower than those (between 15 and 17/100 000) registered over the same calendar period from various areas of the United States [3, 5]. This can be due to a still lower (or under) utilisation of mammographic screening in this population. In 1989, for instance, only approximately 10% of breast cancer cases registered in Vaud were discovered through mammography [19], compared to approximately 30% in the Utah cancer registry among women 50-70 years of age [20], although this proportion may have increased over more recent years, as indicated by National Health Survey data [17]. However, incidence rates of invasive breast cancer in this European population (71/100 000, world standard, in the mid-1980s) were also 30-40% lower than those registered in several areas of North America [21, 22], thus leaving open the possibility that real differences in

the baseline incidence of pre-invasive and invasive breast cancers may explain at least part of the variation in rates observed between North America and Europe.

1. Broders AC. Carcinoma *in situ* contrasted with penetrating epithelium. *JAMA* 1932, **99**, 1670–1674.
2. Schnitt SJ, Silen N, Sadowsky NL, Connolly JL, Harris JR. Ductal carcinoma *in situ* (intraductal carcinoma) of the breast. *N Engl J Med* 1988, **318**, 898–903.
3. Ernster VL, Barclay J, Kerlikowske K, Grady D, Henderson IC. Incidence of and treatment for ductal carcinoma *in situ* of the breast. *JAMA* 1996, **275**, 913–918.
4. Simon MS, Lemanne D, Schwartz AG, Martino S, Swanson GM. Recent trends in the incidence of *in situ* and invasive breast cancer in the Detroit metropolitan area (1975–1988). *Cancer* 1993, **71**, 769–774.
5. Choi WS, Parker BA, Pierce JP, Greenburg ER. Regional differences in the incidence and treatment of carcinoma *in situ* of the breast. *Cancer Epidemiol Biomarkers Prev* 1996, **5**, 317–320.
6. Jatoi I, Baum M. Mammographically detected ductal carcinoma *in situ*: are we overdiagnosing breast cancer? *Surgery* 1995, **118**, 118–120.
7. Nab HW, Voogd AC, Crommelin MA, Kluck HM, V D Heijden LH, Coebergh JWW. Breast cancer in the Southeastern Netherlands, 1960–1989: trends in incidence and mortality. *Eur J Cancer* 1993, **29A**, 1557–1559.
8. Levi F, Te VC, Randimbison L, La Vecchia C. Statistics from the Registry of the Canton of Vaud, Switzerland, 1983–87. In Parkin DM, Muir CS, Whelan CS, Gao YT, Ferlay J, Powell J, eds. *Cancer Incidence in Five Continents*, Vol. VI. Lyon, IARC Scientific Publication No 120, 1992, 762–765.
9. World Health Organization. *International Classification of Diseases for Oncology (ICD-O)*, 1st edn. Geneva, WHO, 1976.
10. Doll R, Smith PG. Comparison between registries: age-standardized rates. In Waterhouse JAH, Muir CS, Shanmugaratnam K, Powell J, Peachman D, Whelan S, eds. *Cancer Incidence in Five Continents*, Vol. VI. Lyon, IARC Scientific Publication No. 42, 1982, 671–675.
11. Van Dongen JA, Holland R, Peterse JL, Fentiman IS, Lagios MD, Millis RR, Recht A. Ductal carcinoma *in situ* of the breast; second EORTC Consensus Meeting. *Eur J Cancer* 1992, **28**, 626–629.
12. Holland R, Hendricks JHCL, Verbeek ALM, Mravunac M, Schuurmans JH, Stekhoven JH. Extent, distribution, and mammographic histologic correlations of breast ductal carcinoma *in situ*. *Lancet* 1990, **335**, 519–522.
13. Holland R, Hendricks JHCL. Microcalcifications associated with ductal carcinoma *in situ*: mammographic–pathologic correlation. *Semin Diagnost Pathol* 1994, **11**, 181–192.
14. Morrow M, Schnitt SJ, Harris JR. Ductal carcinoma *in situ*. In Harris JR, Lippman ME, Morrow M, Hellman S, eds. *Diseases of the Breast*. Philadelphia, PA, Lippincott-Raven, 1996, 355–368.
15. Levi F, Te VC, La Vecchia C. Impact of mammography on breast cancer incidence in Vaud, Switzerland. *J Natl Cancer Inst* 1991, **83**, 1181–1182.
16. De Landtsheer JP, Hessler C, Levi F, De Grandi P, Paccaud F. Le point sur la campagne de dépistage du cancer du sein dans le Canton de Vaud. *Méd Hyg* 1996, **54**, 301–305.
17. Institut suisse de la santé publique (ISP), Lausanne. Enquête suisse sur la santé, 1992–1993. Analyse comparée Vaud-Suisse. SCRS Lausanne, 1996, 42–45.
18. Levi F, Te VC, Randimbison L, La Vecchia C. Trends in cancer incidence and mortality in Vaud, Switzerland, 1974–1993. *Ann Oncol* 1996, **7**, 497–505.
19. La Vecchia C, Negri E, Bruzzi P, Franceschi S, Bucchi L, Parazzini F. The impact of mammography on breast cancer detection. *Ann Oncol* 1993, **4**, 41–44.
20. McWhorter WP, Eyre HJ. Impact of mammographic screening on breast cancer diagnosis. *J Natl Cancer Inst* 1990, **82**, 153–154.
21. Boyle P. Epidemiology of breast cancer. *Baillier's Clin Oncol* 1988, **2**, 1–57.
22. Parkin DM, Muir CS, Whelan S, Gao YT, Ferlay Y, Powell J. (eds.) *Cancer Incidence in Five Continents*, Vol. VI. Lyon, IARC Scientific Publication No. 120, 1992.

Acknowledgements—The contributions of the Swiss Research Against Cancer (Krebsforschung Schweiz; Grant AKT 597), and of the Vaud Cancer Registry's staff are gratefully acknowledged.