

TRENDS IN THE PLACE OF DEATH FOR PATIENTS WHO DIED FROM CANCER IN CANTON TICINO, SOUTHERN SWITZERLAND, 2000-2016

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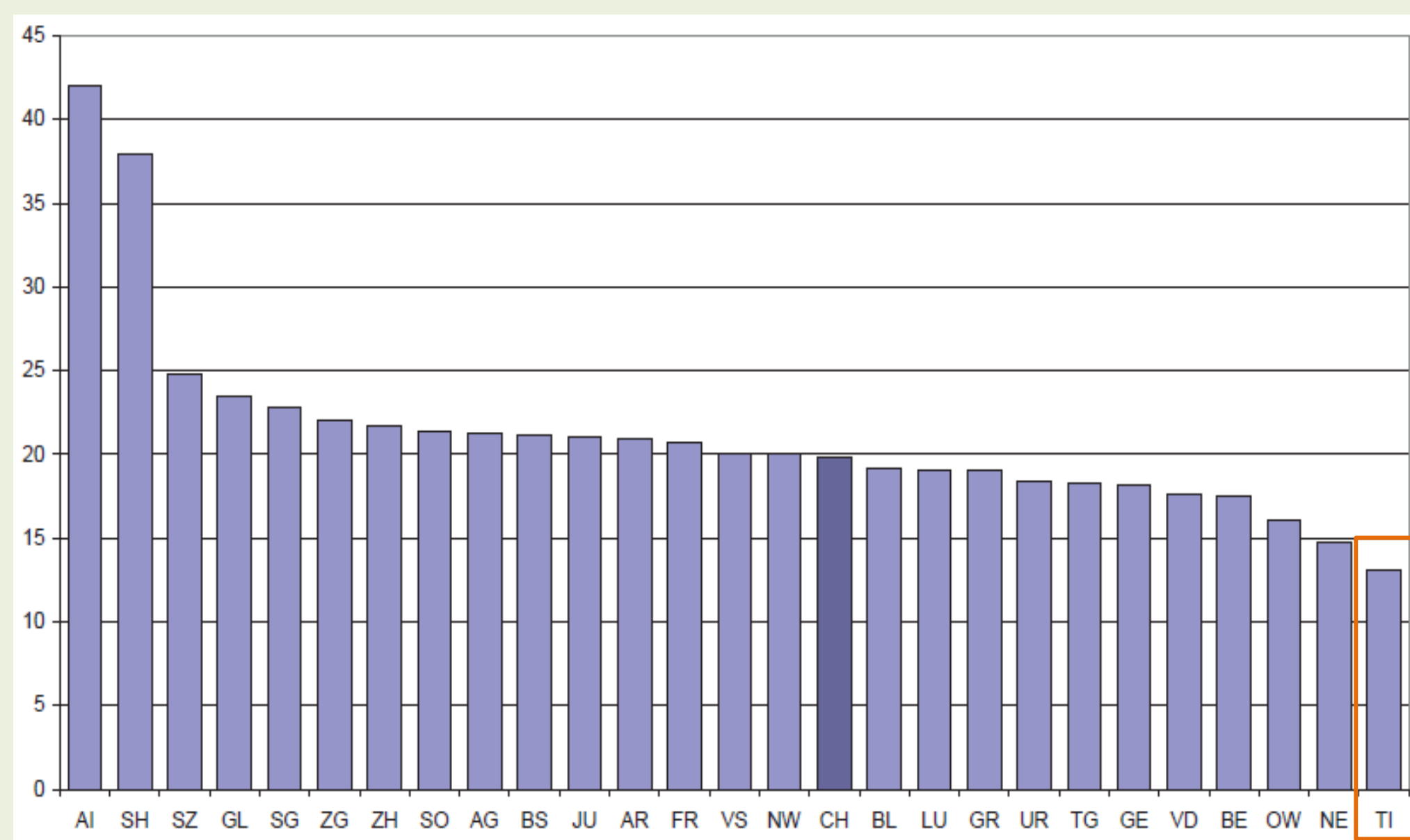
OBJECTIVES

Place of death is considered an important indicator of the quality of end-of-life care. It is the result of a complex interaction of health care policy as well as organizational, social and cultural factors causing large cross-national differences in the proportion of patients dying in hospital.

Despite patients with progressive illness generally prefer to die at home, the majority of cancer patients still die in hospital (Gomes *et al.*, 2013). In 2009, canton Ticino was the region of Switzerland with the lowest percentage of people dying at home (13%) (Figure 1, Junker C., 2012).

Aim of the study: to analyze, in a population-based setting, the evolution and the factors influencing the place of death during 2000-2016 in canton Ticino, southern Switzerland, who died because of lung, colorectal, prostate or breast cancer.

Figure 1: Proportion of patients died at home for any cause of death in Switzerland, 2009



RESULTS

Of the 5587 cases of cancer deaths considered in the analysis 66.7% (95%CI:65.5%;67.9%) were in hospital and 33.3% (95%CI:32.1%;34.5%) at home. During 2000-2016 we observed a significant decrease in the proportion of patients died in hospital (APC: -0.86, 95%CI: -1.44;-0.29) and a significant increase in the proportion of patients died at home (APC: 1.68, 95%CI: 0.44;2.94) (Figure 2).

Patients characteristics are summarized in Table 1. Univariate analysis showed that the likelihood of dying in hospital was lower for women ($p=0.0021$); on the other side, marriage ($p<0.0001$), metastatic disease ($p<0.0001$) and lung cancer ($p<0.0001$) were associated with an increased likelihood of dying in hospital. Furthermore, the proportion of hospital deaths decreased with age (Figure 3).

Multivariate logistic regression confirmed that age at death (OR=0.96, $p<0.0001$), civil status (OR=1.17, $p=0.0148$) and lung cancer (OR=1.25, $p=0.0026$) are independent factors influencing the probability of dying in hospital (Table 2).

Table 1: Main characteristics of patients with death due to cancer. Canton Ticino, 2000-2016

Variable	All cases N=5587 (100%)	Death in hospital N=3726 (66.7%)	Death at home N=1861 (33.3%)	p-Value
Age at death (years) Mean ± sd	73.4±11.6	71.5±11.4	77.1±11.3	$p<0.0001$
Sex				$p=0.0021$
Men	3395 (60.8%)	2317 (62.2%)	1078 (57.9%)	
Women	2192 (39.2%)	1409 (37.8%)	783 (42.1%)	
Civil status				$p<0.0001$
Not married	2372 (42.4%)	1466 (39.3%)	906 (48.7%)	
Married	3215 (57.5%)	2260 (60.7%)	955 (51.3%)	
Tumour site				$p<0.0001$
Colon-Rectum	1400 (25.1%)	885 (23.8%)	515 (27.7%)	
Lung	2726 (48.8%)	1969 (52.8%)	757 (40.7%)	
Breast	615 (11.0%)	374 (10.0%)	241 (13.0%)	
Prostate	846 (15.1%)	498 (13.4%)	348 (18.7%)	
Metastasis at diagnosis				$p<0.0001$
Non-metastatic (M0)	2967 (53.1%)	1889 (50.7%)	1078 (57.9%)	
Metastatic (M1)	2620 (46.9%)	1837 (49.3%)	783 (42.1%)	

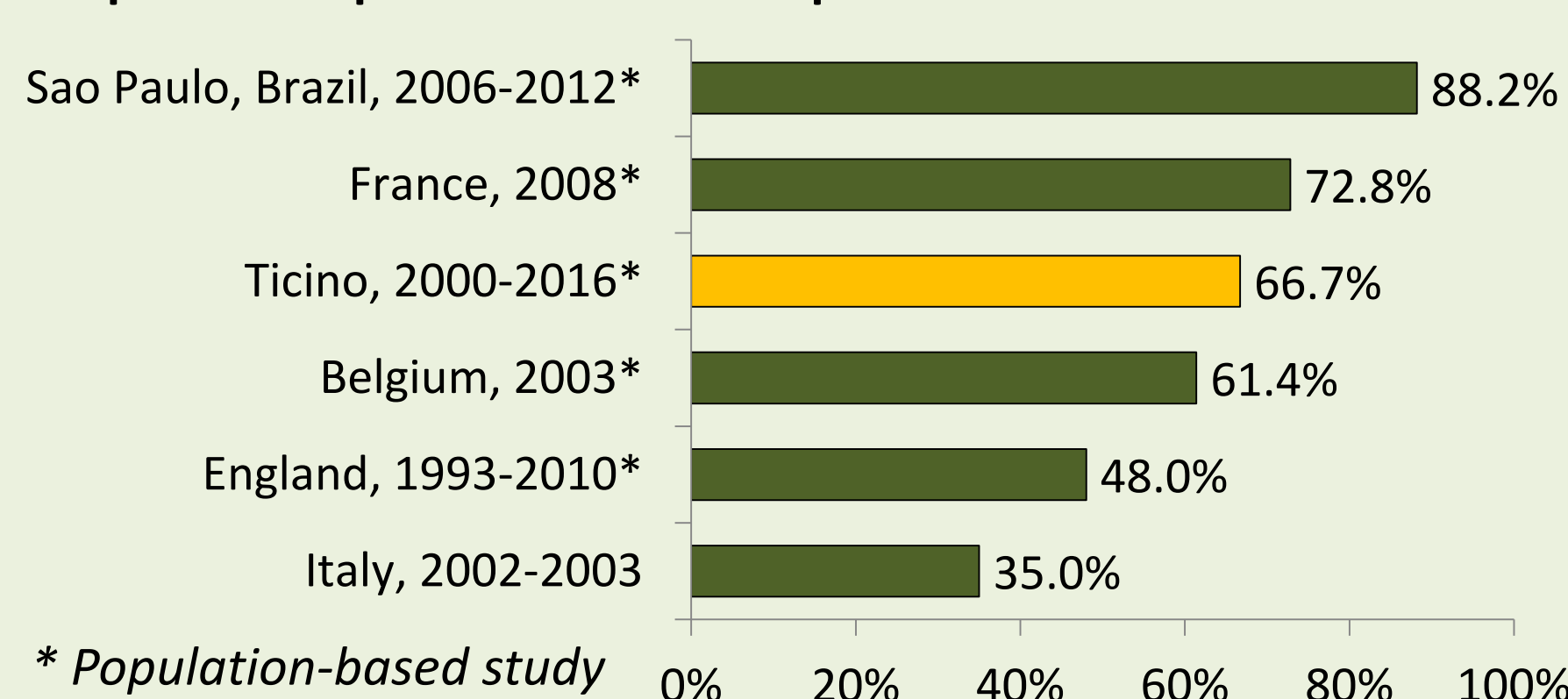
DISCUSSION

During 2000-2016 in canton Ticino the majority of cancer patients died in hospitals. Patients with younger age, who were married and had lung cancer were more likely to die in hospital.

The results emerged from the literature on the place of death are often contradictory and showed large national differences in the proportion and trends of hospital deaths, as well as in the influence of age, sex and marital status on the probability of dying in hospital. A predominance of hospital deaths in cancer patients was shown in Brazil, France and Belgium, but not in Italy (Figure 4). Home deaths showed a decreasing trend in Brazil, whereas in England this trend increased such as in canton Ticino (Ferreira Leite AK *et al.*, 2018; Gomes B *et al.*, 2011).

In our study the variable sex, although significant at the univariate level, was not a predictor of hospital death in the multivariate analysis. However, in Netherlands, Norway and England women were less likely to die at home than men, although the opposite occurred in Italy (Cohen J *et al.*, 2010).

Figure 4: Proportion of patients died in hospital



MATERIALS AND METHODS

All patients resident in canton Ticino, with diagnosis of invasive lung, colorectal, prostate or breast cancer died because of cancer during the period 2000-2016 were considered in the analysis. Information on the cause and place of death were extracted from the original medical death certificates, while data on age, civil status and disease stage were available from the documentation collected by the Ticino cancer registry.

The variable "place of death" was divided in two groups: "hospital" (including hospital, private clinic or ambulance) and "home" (including hospice, nursing/care home or private residence). Patients with unknown place of death (2.7%) were excluded from the analysis. The variable "civil status" was divided into "married" and "not married" (including divorced, separated, single and widowed).

Trends over the years of the place of death were measured as the estimated annual percent change (APC) with the 95% confidence interval (95%CI).

Univariate analysis of categorical variables was performed using the Chi-Square test and differences in mean age at death through the t-test. Odds ratio (OR) with the corresponding 95%CI were calculated through the binary logistic regression with the place of death as dependent variable, whereas the independent variables were sex, mean age at death, presence of metastasis, tumour site and civil status.

The statistical analysis was implemented in the SAS System version 9.3 (SAS Institute Inc., Cary, NC) and Joinpoint Regression Program, Version 4.1.0, April 2014 (Statistical Research and Applications Branch, National Cancer Institute).

Figure 2: Trend in the place of death due to cancer. Canton Ticino, 2000-2016

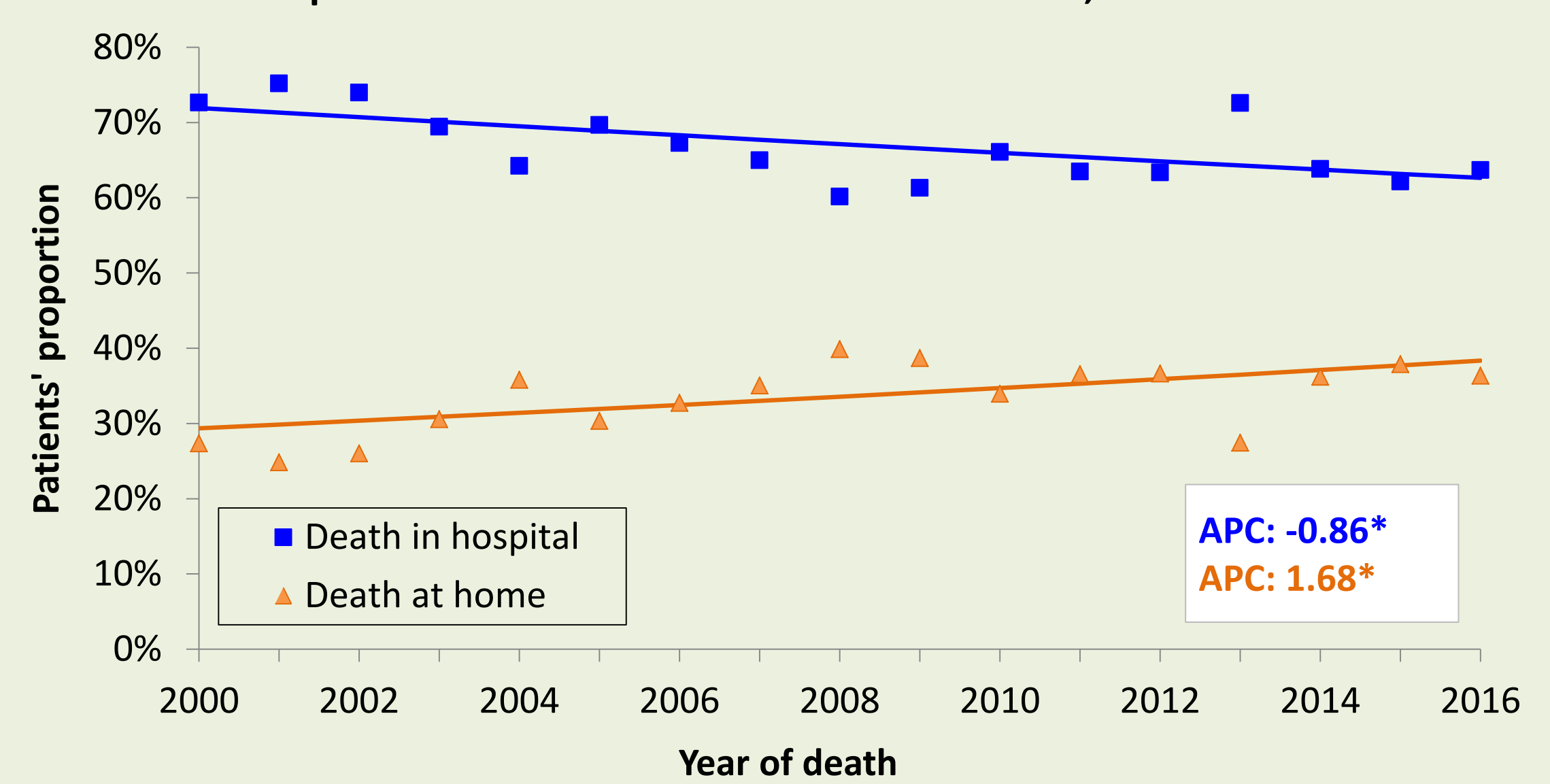


Figure 3: Place of death with respect to age class. Canton Ticino, 2000-2016

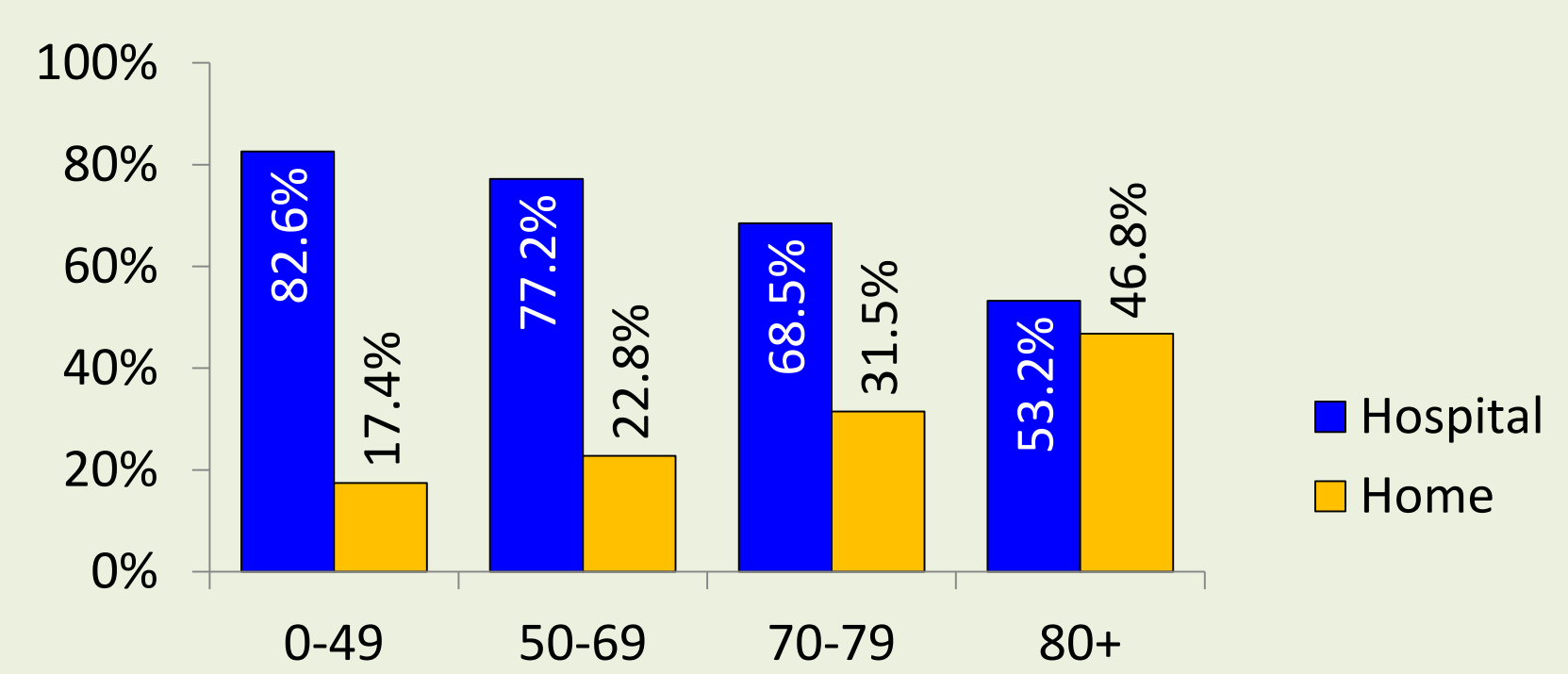


Table 2: OR and 95%CI for multivariate logistic regression on dying in hospital for patients with death due to cancer. Canton Ticino, 2000-2016

Variable	OR	95%CI	p-value
Age at death	0.96	0.96;0.97	$p<0.0001$
Sex			
Men	-	-	-
Women	0.89	0.77;1.03	$p=0.1259$
Civil status			
Not married	-	-	-
Married	1.17	1.03;1.33	$p=0.0148$
Tumour site			
Colon-Rectum	-	-	-
Lung	1.25	1.08;1.44	$p=0.0026$
Breast	0.92	0.74;1.15	$p=0.4685$
Prostate	0.92	0.76;1.12	$p=0.4131$
Metastasis at diagnosis			
Non-metastatic (M0)	-	-	-
Metastatic (M1)	1.08	0.96;1.22	$p=0.1998$

Limits of the present study:

- o the lack of comparison with data of cancer patients died for any cause of death;
- o limitation of the analysis to four tumour sites;
- o the definition of the variable "civil status" could cause difficulties in comparison with data in the literature since the "not married" category is divided into: single, widowed and separated/divorced.

Strengths of the present study:

- o the population-based setting;
- o the evaluation and completion of death certificate data according to the data collected from the Ticino cancer registry reduced the risk of miscoding and misclassification of cause of death;
- o identification of regional risk group on which the end-of-life care should focus its improvements.

Take home message

Place of death may be considered an indicator on the approach of the society to the organization of the end-of-life care. An increasing trend in the proportion of patients who died at home was observed, but more efforts are needed to reduce hospital deaths.

Health and palliative care facilities should be improved and enhanced to support the increasing number of home deaths and sufficient resources should be provided in order to respect patients' preferences and needs on the place of death.

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