Trends in net survival from colon cancer in six European Latin countries: results from the SUDCAN population-based study

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Colon cancer represents a major public health issue. The aim of the SUDCAN collaborative study was to compare the net survival from colon cancer between six European Latin countries (Belgium, France, Italy, Portugal, Spain, and Switzerland) and provide trends in net survival and dynamics of the excess mortality rates up to 5 years after diagnosis. The data were extracted from the EUROCARE-5 database. First, net survival was studied over the 2000–2004 period using the Pohar-Perme estimator. For trend analyses, the study period was specific to each country. Results were reported from 1992 to 2004 in France, Italy, Spain, and Switzerland and from 2000 to 2004 in Belgium and Portugal. These analyses were carried out using a flexible excess rate modeling strategy. There were few differences between countries in age-standardized net survivals (2000–2004). During the 2000–2004 period, the 5-year net survival ranged between 57 (Spain and Portugal) and 61% (Belgium and Switzerland). The age-standardized survival at 1 and 5 years after diagnosis increased between 1992 and 2004. This increase was observed at ages 60 and 70, but was less marked at 80. This increase was linked to a marked decrease in the excess mortality rate between 1992 and 2004 until 18 months after diagnosis. Beyond this period, the decrease in the excess mortality rates among countries was modest and nearly the same whatever the year of diagnosis. There were minor differences in survival after colon cancer between European Latin countries. A considerable improvement in the 5-year net survival was observed in all countries, but the gain was mainly limited to the first 18 months after diagnosis. Further improvements are expected through the implementation of mass screening programs. ***European Journal of Cancer Prevention*** **26:S40–S47 Copyright © 2017 Wolters Kluwer Health, Inc. All rights reserved.**

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Introduction

In 2012, Belgium, France, Italy, Portugal, Spain, and Switzerland registered altogether 141 861 cases of colorectal cancer and this disease was responsible for 60 213 deaths (Ferlay *et al.*, 2013). In these countries, in 2012, the age-standardized (world) incidence of this cancer ranged from 29.4 to 36.7 and the mortality rates ranged from 9.3 to 13.6 per 100 000 person-years. Colon cancer represented about 2/3 of colorectal cancers. The European mean age-standardized 5-year relative survival after colon cancer in the EUROCARE-5 study was 57% (de Angelis *et al.*, 2014), which makes this cancer a major public health issue. For colon cancer, there were no significant improvements in diagnostic strategy or treatment (with the exception of adjuvant chemotherapy in stage III) over the 1989–2004 period and mass screening was organized only recently.

For meaningful survival comparisons between countries or time periods, a reliable indicator is needed. Net survival from cancer is the survival that would be observed if cancer were the only cause of death. This major epidemiological indicator thus enables comparisons without interference from other causes of death. The mortality rate associated with net survival is called the excess mortality rate (EMR); it corresponds to the mortality due to cancer that adds to the expected mortality due to the other causes. It is thus highly informative to provide, in addition to the net survival, a detailed description of the dynamics of the EMR over the time elapsed since diagnosis.

The present study was carried out on the basis of an initiative of the GRELL (network for cancer registration and epidemiology in European Latin countries) (*http://www.grell-network.org*) in collaboration with the EUROCARE network (*http://www.eurocare.it*). One of its objectives was a brief overview of the net survival after colon cancer over the 2000–2004 period in each

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participating country, but its main objective was to investigate the trends in net survival and dynamics of the EMR up to 5 years after diagnosis.

Materials and methods

Data collection

The material and the methods of the present study have been detailed previously (Crocetti *et al.*, 2016; Uhry *et al.*, 2016). Briefly, incident cases of primary invasive colon and rectosigmoid junction cancers (ICD-O-3 topography codes C18 and C19) in patients aged over 15 years were extracted from the EUROCARE-5 database (de Angelis *et al.*, 2014) for Belgium, France, Italy, Portugal, Spain, and Switzerland. The end of follow-up was 1 January 2009, except in France (1 January 2008). For Belgium, France, Italy, and Switzerland, the expected mortality rates were obtained using the general population life-tables (by sex, age, year of diagnosis, and registry area) extracted from the EUROCARE database. For Portugal and Spain, the national mortality rates were extracted from the Human Mortality Database (*http://www.mortality.org*).

First, net survival was studied for patients diagnosed between 2000 and 2004 using data from 52 registries (see Supplementary Table S1, Supplemental digital content 1, *http://links.lww.com/EJCP/A98*): 11 for France, 24 for Italy, eight for Spain, six for Switzerland, two for Portugal, and the Flemish registry for Belgium. Second, the analyses of the trends in net survival were performed using 28 registries with cases collected during a specific period for each country: 1989–2004 for France (seven registries), 1988–2004 for Italy (nine registries), 1990–2004 for Spain (four registries), 1989–2007 for Switzerland (five registries), 2000–2005 for Portugal (two registries), and 1999–2007 for Belgium. These study periods were defined by combining the number of registries and the length of the period to obtain the maximum available information. For these trends, the results are reported for years 1992, 1996, 2000, and 2004 in France, Italy, Spain, and Switzerland (qualified as long study period countries) and for the years 2000 and 2004 in Belgium and Portugal (qualified as short study period countries).

Finally, 121 050 cases could be used for net survival analyses in 2000–2004 and 196 102 cases for trend analyses. The registries' population coverage for the net survival analyses in 2000–2004 was 58% for Belgium, 15% for France, 30% for Italy, 76% for Portugal, 13% for Spain, and 29% for Switzerland. The corresponding percentages for trend analyses were 58, 9, 14, 76, 11, and 25%, respectively.

Cases recorded from death certificates only, autopsy only, or with a coding error after EUROCARE data quality checks were excluded: from 0 to 3.0% for net survival analyses in 2000–2004 and from 0 to 3.9% for trend analyses according to countries. The proportion of microscopically verified cases ranged from 94.1 to 97.6% for net survival analyses in 2000–2004 and from 92.3 to 97.6% for trend analyses. The proportion of patients lost to follow-up at 5 years ranged from 0.7 to 3.8% and from 0.2 to 2.4%, respectively.

Statistical analysis

The net survival values in 2000–2004 were obtained using the Pohar–Perme estimator (Perme *et al.*, 2012). Trend analyses were carried out using a flexible excess rate modeling strategy applied to each country; thus, 18 models were constructed to take into account the effect of the year of diagnosis in terms of linearity, proportionality, and change with age. A 19th model assumed no such effect (Uhry *et al.*, 2016). All 19 models included age and time since diagnosis as continuous variables. The final model was selected using the Akaike information criterion. The net survival is provided as age standardized at 1 and 5 years together with the EMRs at three different ages (the 20th, 50th, and 80th age-percentiles). The age-standardized net survival values were calculated using the International Cancer Survival Standard weights.

Results

Between-country differences in net survival (2000–2004)

There were few differences in age-standardized net survival between countries (Table 1). Overall, the 1-year net survival ranged between 77 (Spain and Portugal) and 82% (Switzerland and Belgium) and the 5-year net survival ranged between 57 (Spain and Portugal) and 61% (Switzerland and Belgium). Between-country differences were observed in men and women, though there were few differences in 1- and 5-year age-standardized net survival values between men and women in any given country (Table 1). Between-country differences in net survival were of the same magnitude in all age groups (Supplementary Table S2, Supplemental digital content 1, *http://links.lww.com/EJCP/A98*). Survival was highest in patients aged 15–54 years. It decreased slightly in those aged 55–74 years and was further reduced in the 75–84 years age group. The 5-year net survival ranged between 63 (Portugal) and 70% (Switzerland) in the 15–54 years age group, between 58 (Portugal) and 63% (France and Italy) in the 55–74 years age group, and between 49 (Spain) and 57% (Switzerland) in the 75–84 years age group (Supplementary Table S2, Supplemental digital content 1, *http://links.lww.com/EJCP/A98*).

Time trends in net survival and excess mortality rates

Table 2 and Fig. 1 show the trends in age-standardized net survival at 1 and 5 years for different years of diagnosis. In long study period countries, the absolute increase in the 1-year net survival between 1992 and 2004 was 4% in France, 7% in Italy, 7% in Spain, and 6%

Table 1 Number of cases and age-standardized net survival [% (95% CI)] from colon cancer at 1 and 5 years by sex and country (2000–2004)

	Men			Women			All	
	N	1 year	5 years	*N*	1 year	5 years	1 year	5 years
France	10 206	81 (80–82)	60 (58–61)	8775	82 (82–83)	62 (60–63)	81 (81–82)	60 (60–61)
Italy	28 408	80 (80–81)	60 (59–60)	24 677	80 (80–81)	61 (60–61)	80 (80–81)	60 (59–61)
Spain	8505	77 (76–78)	57 (56–59)	5936	77 (76–78)	57 (56–59)	77 (76–78)	57 (56–58)
Switzerland	2215	83 (81–84)	61 (59–64)	2015	82 (80–84)	62 (60–65)	82 (81–83)	61 (60–63)
Belgium	8111	81 (80–82)	60 (58–61)	7410	83 (82–84)	63 (61–64)	82 (81–82)	61 (60–62)
Portugal	8208	77 (76–78)	56 (55–58)	6584	78 (77–79)	58 (56–59)	77 (76–78)	57 (56–58)

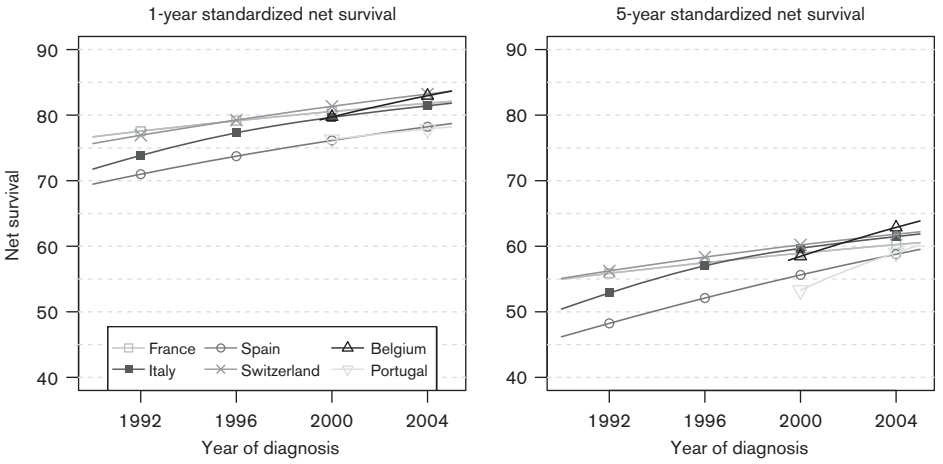
CI, confidence interval.

Table 2 Number of cases and age-standardized net survival [% (95% CI)] from colon cancer at 1 and 5 years by country and year of diagnosis

		1 year				5 years			
	N	1992	1996	2000	2004	1992	1996	2000	2004
France	33 676	78 (77–78)	79 (79–80)	81 (80–81)	82 (81–82)	56 (55–57)	57 (57–58)	59 (58–60)	60 (59–61)
Italy	77 706	74 (73–74)	77 (77–78)	80 (79–80)	81 (81–82)	53 (52–54)	57 (56–58)	60 (59–60)	61 (61–62)
Spain	25 301	71 (70–72)	74 (73–74)	76 (76–77)	78 (77–79)	48 (47–50)	52 (51–53)	56 (55–56)	59 (58–60)
Switzerland	13 050	77 (76–78)	79 (79–80)	81 (81–82)	83 (82–84)	56 (54–58)	58 (57–59)	60 (59–61)	62 (60–63)
Belgium	28 193	–	–	80 (79–80)	83 (82–83)	–	–	58 (57–60)	63 (62–64)
Portugal	18 176	–	–	76 (75–78)	78 (77–79)	–	–	53 (51–55)	59 (58–60)

CI, confidence interval.

Fig. 1



Trends in age-standardized net survival (%) from colon cancer at 1 and 5 years by country.

in Switzerland. The corresponding increases in the 5-year net survival were 4, 8, 11, and 6%, respectively. Figure 1 shows that the between-country differences had less amplitude in 2004 than in 1992, especially 5 years after diagnosis. The survival also improved in the short study period countries. The absolute increase in the 1-year net survival between 2000 and 2004 was 3% in Belgium and 2% in Portugal. The corresponding increases in the 5-year net survival were 5 and 6%, respectively.

Table 3 shows the trends in net survival at three ages: 60 (20th age-percentile), 70 (median age), and 80 (80th age-percentile). In long study period countries, the 5-year net survival increased with the year of diagnosis at all ages, except in the elderly in France. The 5-year net survival at age 60 increased more rapidly in Spain, which had initially, in 1992, the lowest survival in comparison with the other three countries. In 2004, the 5-year net survival at age 60 became similar in the four countries. A similar trend was observed in patients aged 70. However, some differences between countries persisted; for example, the 5-year net survival varied between 60 (Spain) and 66% (Switzerland). Survival improvement was smaller in patients aged 80. In short study period countries, the 5-year net survival increased from 2000 to 2004 at all ages.

Table 3 Net survival [% (95% CI)] from colon cancer at 5 years by age, country, and year of diagnosis

	Age 60				Age 70				Age 80			
	1992	1996	2000	2004	1992	1996	2000	2004	1992	1996	2000	2004
France	59 (58–60)	61 (61–62)	64 (63–65)	66 (65–67)	57 (55–58)	58 (58–59)	60 (59–61)	62 (60–63)	51 (50–53)	52 (50–53)	52 (51–53)	52 (50–54)
Italy	57 (57–58)	62 (61–62)	65 (64–65)	67 (66–68)	55 (54–56)	59 (58–59)	62 (61–63)	65 (64–66)	47 (46–48)	51 (50–52)	54 (53–55)	55 (54–57)
Spain	51 (49–53)	56 (55–57)	61 (60–62)	66 (64–67)	49 (47–50)	53 (52–54)	57 (56–58)	60 (59–62)	45 (42–47)	46 (45–48)	48 (46–49)	49 (47–51)
Switzerland	59 (57–61)	62 (60–63)	64 (63–66)	67 (64–69)	58 (55–60)	61 (59–62)	64 (62–65)	66 (64–68)	51 (48–54)	53 (51–55)	54 (52–56)	56 (53–58)
Belgium	–	–	62 (60–64)	65 (63–66)	–	–	60 (58–61)	63 (62–65)	–	–	52 (50–54)	59 (57–61)
Portugal	–	–	59 (56–61)	62 (61–63)	–	–	55 (52–57)	59 (57–60)	–	–	46 (43–49)	54 (52–57)

CI, confidence interval.

Figure 2 shows the changes in the EMR according to the time elapsed since diagnosis for different years of diagnosis at ages 60, 70, and 80 (Supplementary Tables S3–S5, Supplemental digital content 1, *http://links.lww.com/EJCP/A98*). Figure 3 shows the corresponding net survival curves (which indicate the impact of changes in EMR across the follow-up period on the final survival curve). In all countries and whatever the age or the year of diagnosis, the EMR was high just after diagnosis, but decreased considerably over 18 months after diagnosis. Beyond this period, the decrease in the EMRs was modest and almost the same whatever the year of diagnosis in the participating countries. The decrease in the EMR persisted up to 5 years after diagnosis. However, the EMR never went down to 0, even after 5 years of follow-up. The initial EMRs were higher as age increased in all countries. They were overall higher in Spain, particularly at the beginning of the study, leading to lower survival in the early years in this country (Fig. 3 and Supplementary Table S6, Supplemental digital content 1, *http://links.lww.com/EJCP/A98*).

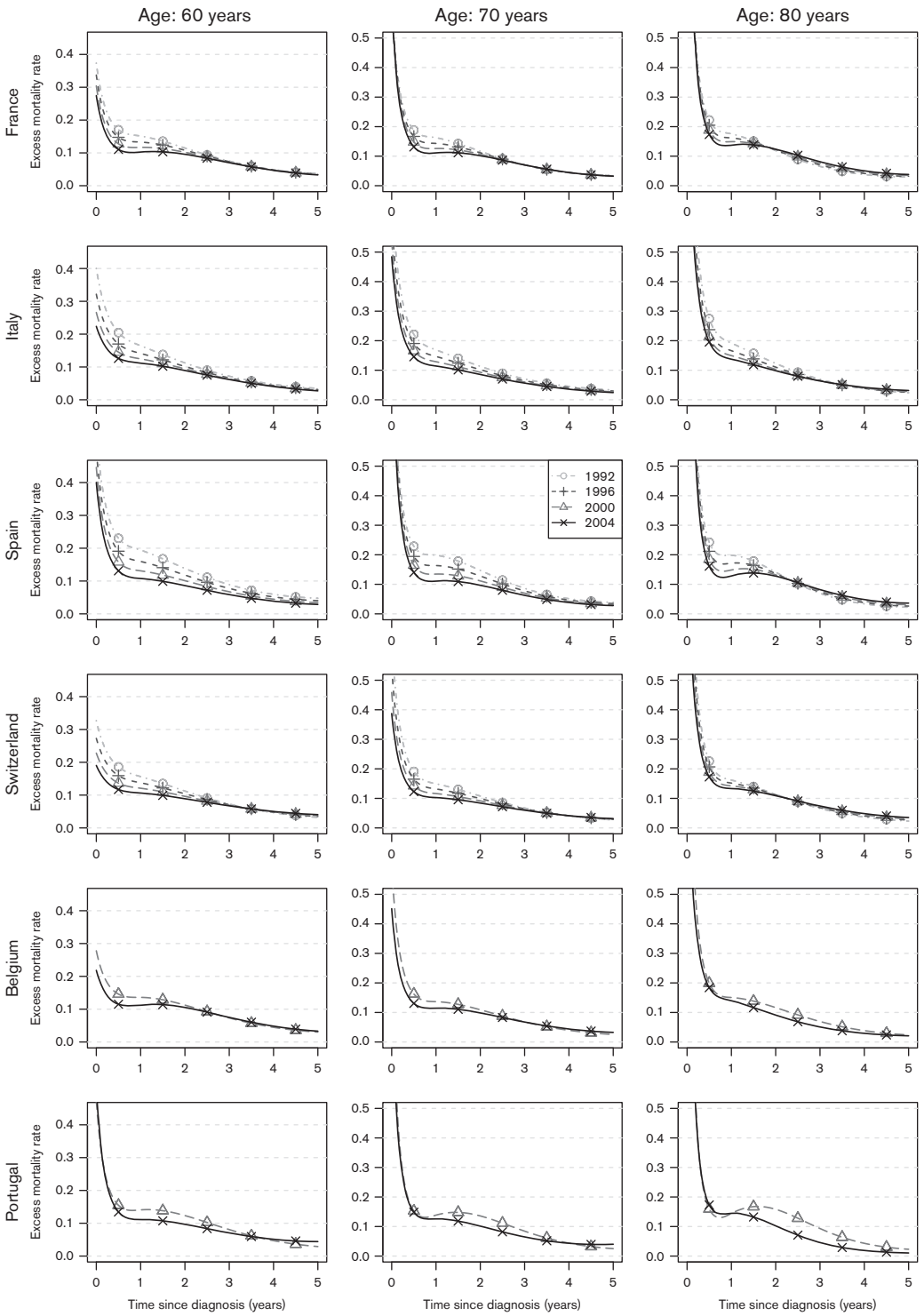
In long study period countries, the decrease in EMR with the year of diagnosis from 1992 to 2004 was limited to the first 18 months after diagnosis in Italy, Spain, and Switzerland. Beyond 18 months, the EMR stabilized whatever the country and the year of diagnosis. In France, the decrease in EMRs with the year of diagnosis over the first 18 months following diagnosis was less significant than in the other three countries at ages 60 and 70 and there was no change in EMR with the year of diagnosis at age 80. In short study period countries, comparable trends in the EMR were observed.

The net survival (Fig. 3) increased considerably from 1992 to 2004, except at age 80 in France, which is in agreement with Fig. 2. This improvement in survival could be observed as early as 18 months after diagnosis in long study period countries. The absolute increase per country in the 1-year net survival ranged from 6 (France and Switzerland) to 9% (Spain) between 1992 and 2004 at age 60, from 4 (France) to 8% (Switzerland) at age 70, and from 2 (France) to 8% (Italy) at age 80 (Fig. 3 and Supplementary Table S6, Supplemental digital content 1, *http://links.lww.com/EJCP/A98*). This favorable trend in the 1-year net survival is in agreement with the decrease in EMRs with the year of diagnosis observed over the 18 months following diagnosis in Fig. 2. In Belgium and Portugal, an improvement in the 1-year survival was observed at all ages between 2000 and 2004.

Discussion

This study provides detailed analyses of trends in net survival and in the dynamics of EMR in six European Latin countries. This study benefited from the standardized protocols for data collection and quality control of the EUROCARE study (de Angelis *et al.*, 2014), which emphasizes the interest of such a large collaboration.

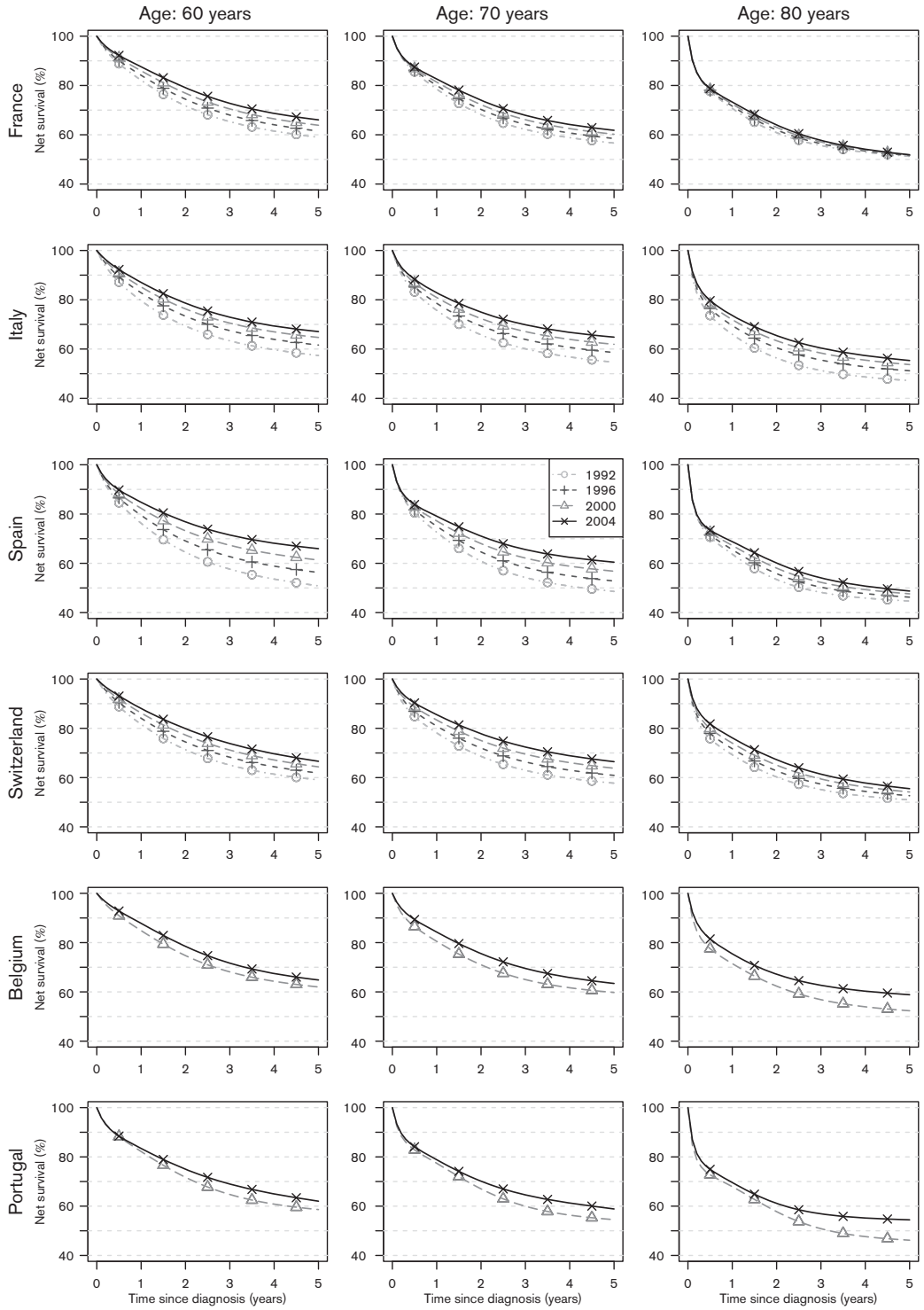
Fig. 2



Excess mortality rates (deaths per person-year) from colon cancer according to the time since diagnosis by age, country, and year of diagnosis.

Actually, the multivariable modeling developed here (Uhry *et al.*, 2016) is crucial for these trend analyses and, to our knowledge, unique in the epidemiology literature. The main finding was the improvement in EMR between 1992 and 2004, which was limited to the 18 months after diagnosis.

Fig. 3



Net survival curves for colon cancer according to the time since diagnosis by age, country, and year of diagnosis.

The examination of some data quality indicators (the proportion of microscopically verified cases, the proportion of cases lost to follow-up, and the proportion of death certificate-only cases) suggests that the quality of collected data was comparable between countries. However, the available data do not enable full interpretation of the differences in survival and time trends. In fact, cancer registries do not usually collect information

on the main prognostic factors, whereas data on cancer stage at diagnosis, treatment modalities, or comorbidities are needed to improve the interpretation of the results. For example, one important finding was that there were slight differences in net survival from colon cancer between European Latin countries, especially over recent years, and high-resolution studies with data on cancer stage at diagnosis, treatment, and comorbidities are needed to explain the slightly lower survival in Spain and Portugal in comparison with France, Italy, Belgium, and Switzerland.

It is interesting to compare our findings with survival data from population-based registries in the rest of Europe. The net survival from colon cancer in Latin European countries was similar to the high survival reported in most Nordic countries and Central Europe (de Angelis *et al.*, 2014). However, the survival rates in European Latin countries were higher than those in the UK, Denmark, and East European countries. The main cause of low survival in the UK and Denmark was attributed to delayed diagnosis and the quality of preoperative care (Klint *et al.*, 2010). Shortage of public funding and poor access to optimal care might explain the shorter survival in Eastern Europe compared with West European countries (de Angelis *et al.*, 2014).

Here, we found no difference in colon cancer survival between men and women; this was already reported for Europe in the recently reported EUROCARE-5 (de Angelis *et al.*, 2014). However, we found poorer survival in elderly patients. This is often attributed to an age-linked decline in general health and to more advanced cancer stage at diagnosis. This could only be partially true because it was found in Burgundy, France, that the proportion of treated patients was not related to the Charlson comorbidity score (Quipourt *et al.*, 2011). Thus, the proportion of elderly patients not receiving treatment for cure despite no associated comorbidities was high.

Another major finding was that there was an improvement in net survival over the study period. One- and 5-year age-standardized net survival from colon cancer increased in all European Latin countries, particularly in Spain and Italy. Similar changes have been already reported by EUROCARE-5 for Europe (de Angelis *et al.*, 2014) and CONCORD-2 for several countries worldwide (Allemani *et al.*, 2015).

The dynamics of EMR according to age, time since diagnosis, and year of diagnosis indicate when improvement in survival occurs. Surprisingly, the decrease in the EMR with the year of diagnosis from 1992 to 2004 in the participating countries was limited to 18 months after diagnosis. This decrease was clear at ages 60 and 70, but less clear at 80. Beyond 18 months after diagnosis, the EMR became nearly constant whatever the country, the year of diagnosis, or the age group, indicating the absence of late improvement in survival. The decrease in the EMR thus cannot be attributed to earlier diagnosis, which should be associated with a decrease in EMR up to 5 years after diagnosis. An obvious explanation for the decrease in EMR over time soon after diagnosis is the decrease in operative mortality (Mitry *et al.*, 2002; Morris *et al.*, 2011). The development of palliative chemotherapy associated with a 1- or 2-year improvement in survival is another explanation for the improvement in short-term survival (Mitry *et al.*, 2002). Improved early postoperative care can play a role: better training of digestive tractsurgeons, better dissemination of management guidelines, and better management of comorbidities. The shapes of the EMR curves for colon cancer were similar for the participating European Latin countries: the EMR was very high just after diagnosis, but decreased sharply over the first 18 months. In addition, the EMR curves showed a fairly progressive decrease, but never reached zero within 5 years. This is consistent with the current estimated cure times of 9.3 years in France (Chauvenet *et al.*, 2009) and 5–9 years in Italy, variable with sex and age (Dal Maso *et al.*, 2014). The high initial EMR, particularly in the elderly, may be related to advanced cancer stages at diagnosis, with or without comorbidities, that limit the treatment options.

This cooperative study was a detailed analysis of trends in net survival and excess mortality rates in European Latin countries. Its originality lies in the use of the most recent advances in the methodology of estimating net survival and in a detailed analysis of the EMR according to the year of diagnosis, the time elapsed since diagnosis, and age. The results indicated improvements in colon cancer survival over 18 months after diagnosis, in all age classes and countries, except the elderly in France. The absence of a later decrease in the EMR between 1992 and 2004 suggests that an earlier diagnosis is not an explanation for the improvement in the 5-year net survival reported between 1992 and 2004.

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Conflicts of interest

There are no conflicts of interest.

References

Allemani C, Weir HK, Carreira H, Harewood R, Spika D, Wang XS, *et al.* (2015). Global surveillance of cancer survival 1995–2009: analysis of individual data

for 25 676 887 patients from 279 population-based registries in 67 countries (CONCORD-2). *Lancet* **385**:977–1010.

Chauvenet M, Lepage C, Jooste V, Cottet V, Faivre J, Bouvier AM (2009). Prevalence of patients with colorectal cancer requiring follow-up or active treatment. *Eur J Cancer* **45**:1460–1465.

Crocetti E, Bossard N, Uhry Z, Roche L, Rossi S, Capocaccia R, *et al.*; the GRELL EUROCARE-5 working group (2016). Trends in net survival from 15 cancers in six European Latin countries: the SUDCAN population-based study material. *Eur J Cancer Prev* **25**(Suppl 1):S3–S8.

Dal Maso L, Guzzinati S, Buzzoni C, Capocaccia R, Serraino D, Caldarella A, *et al.* (2014). Long-term survival, prevalence, and cure of cancer: a population-based estimation for 818 902 Italian patients and 26 cancer types. *Ann Oncol* **25**:2251–2260.

De Angelis R, Sant M, Coleman MP, Francisci S, Baili P, Pierannunzio D, *et al.* (2014). Cancer survival in Europe 1999–2007 by country and age: results of EUROCARE-5 – a population-based study. *Lancet Oncol* **15**:23–34.

Ferlay J, Soerjomataram I, Ervik M, Dikshit R, Eser S, Mathers C, *et al.* (2013). *GLOBOCAN 2012 v10, Cancer Incidence and Mortality Worldwide: IARC CancerBase No 11*. Lyon, France: International Agency for Research on Cancer.

Klint A, Engholm G, Storm HH, Tryggvadóttir L, Gislum M, Hakulinen T, Bray F (2010). Trends in survival of patients diagnosed with cancer of the digestive organs in the Nordic countries 1964–2003 followed up to the end of 2006. *Acta Oncol* **49**:578–607.

Mitry E, Bouvier AM, Esteve J, Faivre J (2002). Benefit of operative mortality reduction on colorectal cancer survival. *Br J Surg* **89**:1557–1562.

Morris EJ, Taylor EF, Thomas JD, Quirke P, Finan PJ, Coleman MP, *et al.* (2011). Thirty-day postoperative mortality after colorectal cancer surgery in England. *Gut* **60**:806–813.

Perme MP, Stare J, Estève J (2012). On estimation in relative survival. *Biometrics* **68**:113–120.

Quipourt V, Jooste V, Cottet V, Faivre J, Bouvier AM (2011). Comorbidities alone do not explain the undertreatment of colorectal cancer in older adults: a French population-based study. *J Am Geriatr Soc* **59**: 694–698.

Uhry Z, Bossard N, Remontet L, Iwaz J, Roche L; the GRELL EUROCARE-5 Working Group and the CENSUR Working Survival Group (2016). New insights into survival trend analyses in cancer population-based studies: the SUDCAN methodology. *Eur J Cancer Prev* **25**(Suppl 1):S9–S15.