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Analysis of incidence, mortality and survival for pancreatic and biliary tract cancers across Europe, with assessment of influence of revised European age standardisation on estimates

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ABSTRACT

Background: Pancreatic (PC) and biliary tract (BTC) cancers have higher incidence and mortality in Europe than elsewhere. We analysed time-trends in PC/BTC incidence, mortality, and survival across Europe. Since the European standard population (ESP) was recently revised to better represent European age structure, we also assessed the effect of adopting the revised ESP to age-standardise incidence and mortality data.

Methods: We analysed PCs/BTCs (≥15 years) diagnosed in 2000–2007 and followed-up to end of 2008, in 29 European countries across five regions: UK/Ireland, and northern, central, southern, and eastern Europe. Incidence, mortality, and 5-year relative survival were compared between regions, by age, sex, and period of diagnosis.

Results: Variation in age-standardised incidence (PC 12–15/100,000; BTC 2–6) and mortality (PC 10–14; BTC 1–5) was modest. Eastern Europe had highest incidence and mortality, and lowest survival; northern and southern Europe had highest age-specific incidence (most age groups) for PC and BTC, respectively. Incidence and survival increased slightly from 2000 to 2007, particularly in elderly patients and women, but survival remained poor (≤8% for PC; 13–18% for BTC). Use of the revised ESP for age-standardisation did not impact European regional incidence and mortality rankings.

Conclusion: Poor survival for PC and BTC, together with increasing incidence, indicate that action is required. Countries with higher incidence had higher risk factor frequency, suggesting that prevention initiatives targeting risk factors should be promoted. Improvements in diagnosis and treatment are also required. Our results provide a baseline from which to monitor evolution of the PC/BTC burden in Europe.

1. Introduction

According to the latest available all-age estimates, based on cases diagnosed up to 2007 [1], 338,000 new pancreatic cancer (PC) cases, and 178,000 new biliary tract and gallbladder cancer (BTC) cases were diagnosed worldwide in 2012 [2]. Estimated differences in age-standardised incidence rates (ASR_i, standardised to the world population) between males and females were more marked for PCs than BTCs, with 4.9 (per 100,000) PC cases in males vs. 3.6 in females, and 2.1 BTC cases in males vs. 2.3 in females [2].

PC and BTC are estimated to be 7th and 16th, respectively, most common causes of cancer death in males, and 8th and 13th in females worldwide [2]. The age-standardised mortality rate (ASR_m, per 100,000) for PC was slightly higher in males than females (4.8 vs. 3.4); but the ASR_m for BTC was similar in both sexes (1.6 vs. 1.8) [2].

Compared to other continents, Europe had highest ASR_i (6.8 vs. 2.0–5.9) and highest ASR_m (6.6 vs. 1.9–5.6) for PC, but third highest ASR_i (1.8, range 0.7–2.6) and ASR_m (1.2, range 0.7–2.2) for BTC [3,4].

To render comparable incidence and mortality rates in populations with differing age-structure, age-standardised rates are weighted with factors that align the age-structure of the populations to that of a pre-defined standard population. EUROSTAT, the European Commission Directorate for statistical information, recently introduced a revised European standard population (RESP) that is more representative of the

Abbreviations: PC, pancreatic cancer; BTC, biliary tract cancer (including gallbladder cancer); ASR_i, age-standardised incidence rate; ASR_m, age-standardised mortality rate; ESP, European standard population; RESP, revised European standard population; CR, cancer registry; RS, relative survival; CF, comparative figure; CI, confidence interval; AAPC, average annual percentage change; Δ, percentage differences

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Table 1
Numbers of European pancreatic (PC) and biliary tract/gallbladder (BTC) cancer patients, by country and European region, included in the cohort and time-trend analyses of incidence, mortality and survival.

	Cohort analyses on				Time-trend analyses on			
	Incidence/mortality[a]		Survival[a]		Incidence/mortality[b]		Survival[c]	
	PC	BTC	PC	BTC	PC	BTC	PC	BTC
All cases	**220669**	**73491**	**202583**	**69325**	**180380**	**55159**	**198821**	**66375**
Northern Europe	**19148**	**4482**	**25083**	**7078**	**21222**	**5080**	**39258**	**11902**
Denmark	6536	1354	6502	1381	7249	1542	9846	2233
Finland	7236	1986	6604	1813	7998	2244	10080	3047
Iceland	234	62	230	63	270	70	396	101
Norway	5142	1080	4933	1048	5705	1224	7742	1703
Sweden	[d]	[d]	6814	2773	[d]	[d]	11194	4818
UK and Ireland	**63166**	**12124**	**59016**	**11646**	**70606**	**13592**	**90635**	**18388**
Ireland	3232	1030	3029	989	3585	1159	4614	1527
England	50136	8872	46571	8486	56086	9957	71260	13421
Northern Ireland	1378	447	1321	443	1499	488	1975	643
Scotland	5002	1194	4946	1181	5605	1338	7875	1899
Wales	3418	581	3149	547	3831	650	4911	898
Central Europe	**61625**	**21754**	**51394**	**19264**	**32511**	**10443**	**40723**	**14763**
Austria	10835	3218	8295	2755	12070	3644	12776	4681
Belgium	4203	1172	4826	1410				
France	6604	2004	5347	1808				
Germany	25049	10377	17630	8036	4402	1354	4823	1719
Switzerland	1806	519	2277	701	1471	429	2903	927
The Netherlands	13128	4464	13019	4554	14568	5016	20221	7436
Southern Europe	**38829**	**18046**	**35276**	**16910**	**17148**	**7707**	**22302**	**10552**
Croatia	4926	2386	4441	2205				
Italy	22530	9910	22138	10053	13776	6031	18200	8385
Malta	374	87	307	81	418	93	462	113
Portugal	3784	1922	2881	1539				
Slovenia	2140	1116	2016	1069	2353	1272	2926	1638
Spain	5075	2625	3493	1963	601	311	714	416
Eastern Europe	**37901**	**17085**	**31814**	**14427**	**38893**	**18337**	**45161**	**22672**
Bulgaria	8087	2130	6690	1807	9005	2405	9601	2656
Czech Republic	14026	7974	11279	6511	15529	9001	17021	10412
Estonia	1471	350	1431	341	1648	397	2299	558
Latvia	1763	300	2367	442				
Lithuania	3225	887	2918	828	3638	1027	4929	1399
Poland	3931	2276	3680	2186	3911	2295	6006	3798
Slovakia	5398	3168	3449	2312	5162	3212	5305	3849

Empty cells indicate data not eligible for the analyses.
[a] No. of cases diagnosed in 2000–2007.
[b] No. of cases diagnosed in 1999–2007 in cancer registries eligible for time-trend analyses of incidence and mortality (see Material and Methods).
[c] No. of cases diagnosed in 1995–2007 in cancer registries eligible for time-trend analyses of survival (see Material and Methods).
[d] Sweden was excluded from the incidence and mortality analyses because of incomplete case and mortality registration.

current European age structure, than the European standard population (ESP) introduced in 1976 [5,6].

The aim of the present work was to analyse incidence, mortality, and survival for PC and BTC by age, sex, and period of diagnosis across Europe. Analysis by period of diagnosis produced time- trends indicating how the burden of these diseases has been changing in Europe. An additional aim was to assess the implications of adopting the RESP (in comparison to ESP) for age-standardisation of incidence and mortality rates for these cancers in Europe.

2. Material and methods

We analysed incidence, mortality, and survival for around 70,000 invasive BTCs and > 200,000 PCs (International Classification of Disease [7] codes C23–24 and C25, respectively) diagnosed in 2000–2007 in adult (≥15 years) Europeans, followed-up to the end of 2008 (Table 1). Incidence and mortality data were accessed from the online EUREG database [8]. Survival data were accessed from the online EUROCARE database [9], and the publication of Lepage et al. [10].

Since two separate datasets of derived (not raw) data were used, with the possibility of compatibility problems, we only used data from good-quality [11,12] cancer registries (CRs) (Supplementary Table 1 [Table S1]) eliminating those with data representativity or quality problems, as indicated in Fig. 1.

The incidence/mortality and survival analyses used data from 79 and 88 CRs, respectively, from 29 countries in 5 European regions: northern Europe (Denmark, Finland, Iceland, Norway, Sweden); United Kingdom and Ireland (UK/Ireland: Ireland, Northern Ireland, England, Scotland, Wales); central Europe (Austria, Belgium, France, Germany, Switzerland, The Netherlands); southern Europe (Croatia, Italy, Malta, Portugal, Slovenia, Spain), and eastern Europe (Bulgaria, Czech Republic, Estonia, Latvia, Lithuania, Poland, Slovakia).

Thus, 9 less CRs were included in the incidence/mortality than the survival analyses because: (a) the CRs of Bas Rhin, Burgundy, Basel, and Valais were not present in the EUREG incidence/mortality database; (b) the Italian CRs of Catanzaro, Nuoro, Palermo, and Trapani were excluded from the incidence/mortality analyses since their data overlapped only for 2 (2003–2004) of the 5 (2000–2004) years of the