PANCREAS, BILIARY TRACT, AND LIVER

Global Trends in Pancreatic Cancer Mortality From 1980 Through 2013 and Predictions for 2017

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BACKGROUND & AIMS: **Pancreatic cancer is a leading cause of cancer mortality, and its mortality has not decreased in recent years. We sought to determine global trends in pancreatic cancer mortality.**

METHODS: **We derived data on deaths from pancreatic cancer from the World Health Organization database for 59 countries from 1980 through 2013. Age-standardized mortalities were computed for persons of all ages and for persons 35–64 years old; for selected countries, they were computed for persons 25-49 years old. Joinpoint regression models were used to identify significant changes in mortality. For selected larger countries, we predicted number of deaths and mortality for 2017.**

RESULTS: **Between 1980 and 2013, overall pancreatic cancer mortality in men increased in the European Union (EU) as well as in Southern and Eastern Europe, Brazil, Japan, and Republic of Korea. Overall pancreatic cancer mortality decreased in most Northern European countries, Australia, Canada, Mexico, and the United States (US). In women, mortality increased in the EU, Brazil, US, Japan, and Republic of Korea but decreased in Canada and Mexico. In 2012, Eastern Europe and Japan had the highest pancreatic cancer mortality for both sexes. In men 25–49 years old, mortality decreased in the EU, US, Japan, and most large European countries. On the basis of our data, we predict overall pancreatic cancer mortality in 2017 to level off in men in the EU and US but increase in Japan. In women, mortality will continue to increase in most countries except the US; the greatest increase is predicted to occur in Japan.**

CONCLUSIONS: **Mortality from pancreatic cancer has not decreased as it has for other cancers in recent years. A notable exception is a decrease in mortality in men 25–49 years old, which could indicate a reversal in the current increasing global trends.**

Keywords: Pancreatic Tumor; Rate of Death; Predictions; Trends.

Pancreatic cancer is a leading cause of cancer mortality worldwide, with more than 330,000 new cases and approximately the same number of deaths annually.[1–3] In contrast to most other common cancers, mortality from pancreatic cancer has not decreased in the previous decade.[4] Moreover, the number of pancreatic cancer deaths is likely to further rise in the coming years in the United States (US), and pancreatic cancer may become the second leading cause of cancer death.[5]

We updated our previous reports on global trends in pancreatic cancer mortality[4,6] by analyzing data from the World Health Organization (WHO) database during the years 2002–2012 in Europe, North America, South America, Asia, and Australia. For major countries worldwide, we used joinpoint regression to analyze trends in pancreatic cancer mortality from 1980 to 2013 or most recent available year and provided predictions of number of deaths and mortality to 2017.

Methods

Official death certification data for pancreatic cancer for 37 European countries and 22 other countries worldwide during the period 1980–2013 were derived

Abbreviations used in this paper: EU, European Union; PI, prediction interval; UK, United Kingdom; US, United States; WHO, World Health Organization.

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1542-3565/$36.00
http://dx.doi.org/10.1016/j.cgh.2016.05.034

from the WHO database available on electronic support.[7] We considered countries with (1) at least 2 million inhabitants in the last year available, (2) data available for 20 years or more, and (3) death certification coverage higher than 90%. Thus, in Europe, we considered 37 countries, excluding Albania, whose national coverage was below 80%, and Cyprus, whose data were available only for a few recent years. Most countries of the former Soviet Union were also excluded because of the low coverage. The European Union (EU) was defined as the union of 28 member states as of July 2013, with the exclusion of Cyprus. For the Americas, data from 14 countries were included (ie, Argentina, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Guatemala, Mexico, Panama, Puerto Rico, Uruguay, US, Uruguay, and Venezuela). Mortality data were also available for 5 Asian countries (ie, Hong Kong, Japan, Republic of Korea, Singapore, and Kuwait), Australia, and New Zealand. In a few countries, data were missing for 1 or more calendar years. No extrapolation was made for missing years except for the calculation of the EU rates where when data were not available for 1 or more years within a country, the nearest available data were used.

In the WHO database during the calendar period considered (1980–2013), three different revisions of the International Classification of Diseases were used.[8–10] Because coding differences between various revisions were generally minor, pancreatic cancer deaths were recoded for all countries according to the 10th Revision of the International Classification of Diseases (code = C25).[8]

Estimates of the resident population for the corresponding calendar periods, which were based on official censuses, were obtained from the same WHO database[7]; when missing, they were derived from EUROSTAT for some European countries[11] and from the Pan American Health Organization database for some countries of the Americas.[12,13] Because the Pan American Health Organization database provided sex-specific and 5-year age groups for selected years only, sex-specific and age-specific data for missing years were estimated by interpolation by using the last available year in the WHO database.[7]

From the matrices of certified deaths and resident population, we computed age-specific rates for each 5-year age group and calendar year. Age-standardized mortality per 100,000 men and women was computed by using the direct method on the basis of the world standard population first introduced by Segi in 1960[14] at all ages, truncated at age 35–64 years, and for 16 selected larger countries providing adequate numbers, at age 25–49 years.

To identify significant changes in mortality trends during the period 1980–2013, for 31 selected countries worldwide and the EU as a whole, we used joinpoint regression models allowing for up to 3 joinpoints.[15,16] We also computed the estimated annual percent changes for each of the identified trends and the average annual percent change during the whole period.[15,17]

Moreover, for 8 selected larger countries worldwide and the EU as a whole, we provided estimates of pancreatic cancer deaths and rates for 2017. These were derived by fitting a joinpoint model to the number of certified deaths in each 5-year age group to identify the most recent trend slope and by applying a linear regression on mortality data in each age group during the time period identified by the joinpoint model to compute the predicted age-specific certified number of deaths and the corresponding 95% prediction intervals (PIs).[3,18] Predicted standardized death rates and the corresponding 95% PIs were computed by using the predicted population data from the EUROSTAT,[11] the US Census Bureau,[19] and the Japanese National Institute of Population and Social Security Research[20] databases.

Results

Table 1 shows mortality data from pancreatic cancer in men and women from various countries worldwide and the EU as a whole around 2002 (2000–2004 quinquennium), 2007 (2005–2009 quinquennium), and 2012 (single year), along with the corresponding percent changes. In the EU, overall mortality for men rose from 7.6 to 7.9 per 100,000 (+3.1%) between 2002 and 2007 and was constant around 7.9 per 100,000 (+0.4%) between 2007 and 2012; corresponding changes were from 7.3 to 7.4 (+1.9%) and to 7.6 (+1.7%) per 100,000 in the US and from 8.5 to 8.8 (+3.2%) and to 9.2 (+4.3%) per 100,000 in Japan. Increases in mortality from male pancreatic cancer were observed during the last 10 years in various countries worldwide including Hungary, Portugal, Romania, the Russian Federation, Spain, the United Kingdom (UK), and Brazil. However, some declines in rates were observed during the last 5 years in other countries, including the Czech Republic, France, Germany, Italy, Poland, Argentina, Canada, Mexico, and Australia. In a few countries of Latin America with comparatively low rates, mortality declined between 2002 and 2007 but increased between 2007 and 2012. In EU women mortality rose from 5.0 to 5.2 per 100,000 (+5.4%) between 2002 and 2007 and to 5.4 per 100,000 (+2.6%) in 2012; in the US rates in women rose from 5.3 to 5.4 (+2.7%) and to 5.5 (+0.8%) per 100,000, and in Japanese women rates rose from 5.0 to 5.2 (+5.5%) to 5.8 (+10.3%) per 100,000. In France, Italy, Romania, the Russian Federation, Spain, Argentina, Brazil, and Australia female mortality trends were upward during the last 10 years, whereas they were more favorable, at least during the last 5 years, in the Czech Republic, the Netherlands, Poland, Sweden, Cuba, Mexico, and New Zealand.

Overall age-standardized mortality from pancreatic cancer in men and women from various countries worldwide and the EU as a whole in 2012 are provided