

# Epidemiology of Gastrointestinal Cancer: (Trends in) Incidence and Mortality from Esophageal, Stomach, and Colorectal Cancer

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## Introduction

In the past decades, clinically and population-based studies in developed countries have reported increases in the incidence of adenocarcinoma of the esophagus, gastric cardia, and colorectum. This increase was not observed for squamous cell carcinoma of the esophagus and tumors of the non-gastric part of the stomach; the latter showed a clear decrease in incidence. A strong decrease in mortality from stomach cancer and a moderate decrease in mortality from colorectal cancer have been reported in several Western countries, while mortality rates increased for esophageal cancer. In developed countries, colorectal cancer has a higher incidence and mortality than esophageal and stomach cancer, while the opposite is true for less developed countries (Figs 1.1 and 1.2).

In this chapter, we will give an overview of the current incidence and mortality rates of esophageal, stomach, and colorectal cancer, including geographic variations and male–female differences. We will present the most important trends in time, with a more detailed view on trends in histology of esophageal and gastric cancer incidence and trends in subsite distribution of colorectal cancer incidence. We will discuss age-adjusted trends; it is important to bear in mind that even stable incidence rates can mean large increases in absolute numbers of newly diagnosed cancer patients in Western countries, due to the aging of the population.

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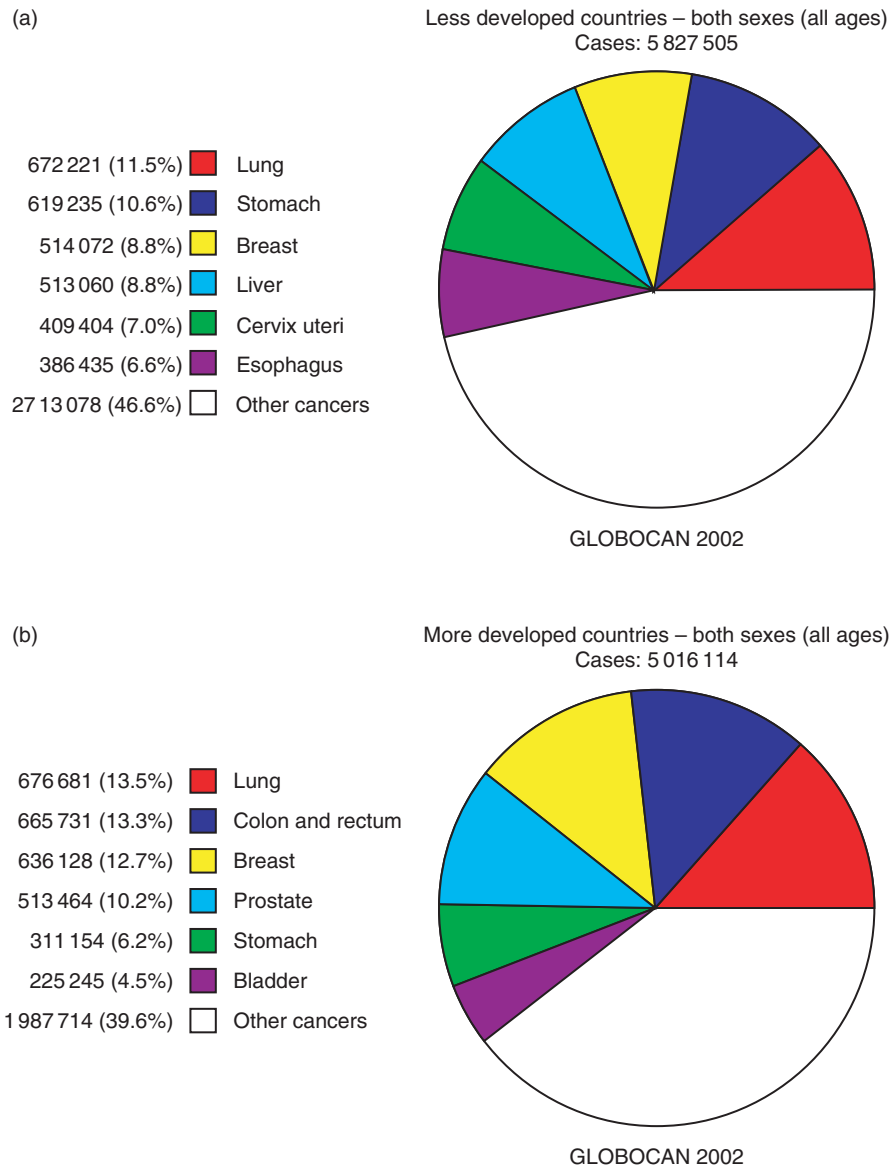


Fig. 1.1 (a) Proportional distribution of incidence of cancer in less developed countries, in 2002. (b) Proportional distribution of incidence of cancer in more developed countries, in 2002.

## Methods

Esophageal, stomach, and colorectal cancer were classified according to the *International Classification of Disease* (ICD, 10th revision): Esophagus (C15), stomach (C16), and colon/rectum (C18–C21).

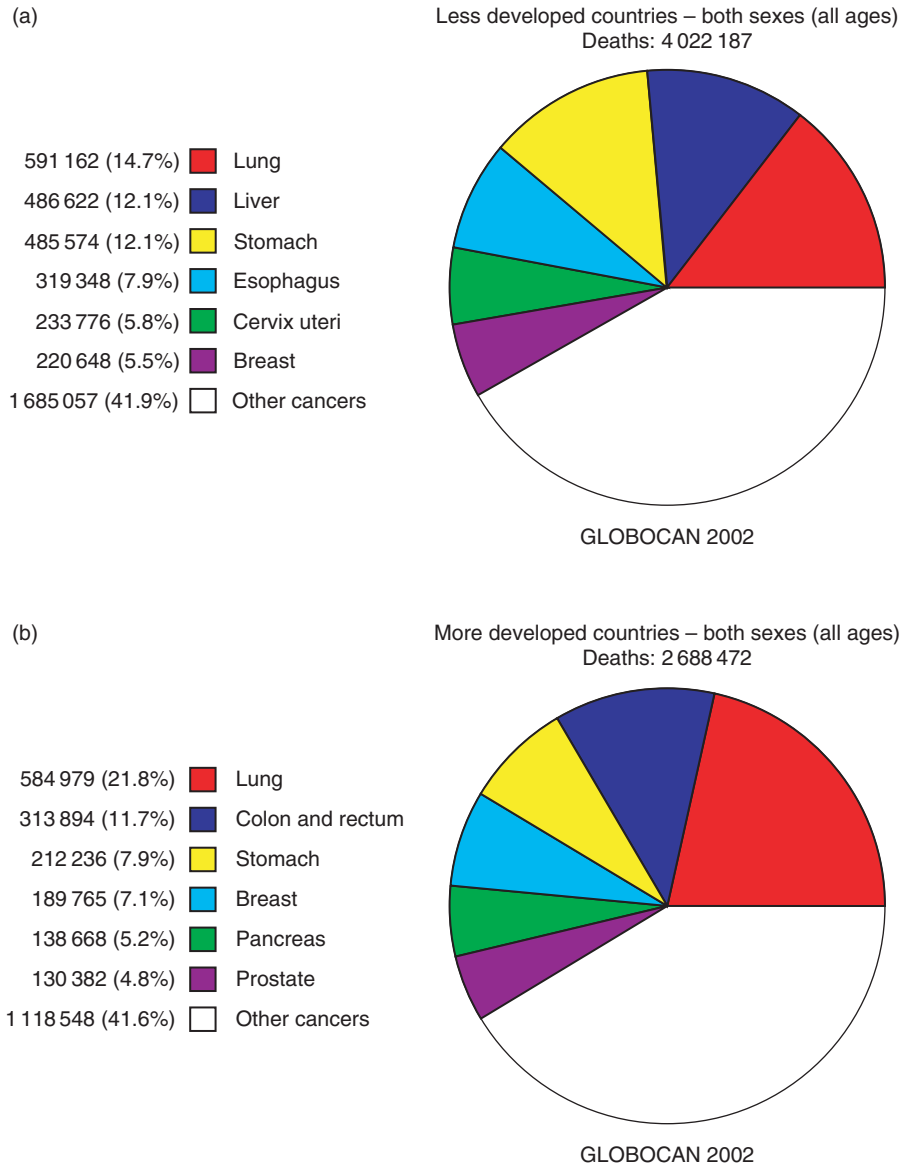


Fig. 1.2 (a) Proportional distribution of mortality from cancer in less developed countries, in 2002. (b) Proportional distribution of mortality from cancer in more developed countries, in 2002.

**Incidence**

Incidence is the number of new cases arising in a given period in a specified population. Cancer registries collect this information routinely. It can be expressed as an absolute number of cases per year or as a rate per 100 000

persons per year. The latter provides an approximation to the average risk of developing a cancer, which is particularly useful in making comparisons between populations.

### **Mortality**

Mortality is the number of deaths occurring in a given period in a specified population. It can be expressed as an absolute number of deaths per year or as a rate per 100 000 persons per year.

### **Population**

Estimates of the population of countries (by age and sex) for the year 2000 and 2005 were taken from the United Nations population projections (the 2002 revision). The population figures for the year 2002 were estimated by calculating the annual percentage change by sex and age between the year 2000 and 2005.

### **Analyses**

All analyses were carried out using the GLOBOCAN software [1]. The GLOBOCAN 2002 database has been built up using the huge amount of data available in the Descriptive Epidemiology Group of the International Agency for Research on Cancer.

Incidence data were available from cancer registries. They cover entire national populations, or samples of such populations from selected regions. Cancer registries also provide statistics on cancer survival. With data on incidence, and on survival, we can estimate the prevalence of cancer (persons who are alive with cancer diagnosed within a given number of years of diagnosis). Mortality data by cause are available for many countries through the registration of vital events, although the degree of detail and quality of the data vary considerably. With such data, it is possible to prepare estimates of the numbers of new and prevalent cancer cases and deaths by site, sex, and age group. These are more or less accurate, for different countries, depending on the extent and accuracy of locally available data.

### **Age-standardized rate**

All data are presented as standardized rates. An age-standardized rate (ASR) is a summary measure of a rate that a population would have if it had a standard age structure. The most frequently used standard population is the World standard population. The calculated incidence or mortality rate is then called the World age standardized incidence or mortality rate. It is expressed as a rate per 100 000.



## Esophageal cancer

The incidence of esophageal cancer in 2002 was particularly high in Western Europe, south-central Asia, eastern Africa, and parts of South America (Figs 1.3 and 1.4). It was lowest in western Africa and in Indonesia. This pattern was equal for both males and females. In the developed countries, the incidence of esophageal cancer was the highest in the United Kingdom, France, Ireland, and Japan, and lowest in Norway, Finland, and Malta (Fig. 1.5). The incidence in males was much larger than in females, this difference was largest in France and Slovakia.

In countries with a high incidence of esophageal cancer, such as Japan and the United Kingdom, the incidence was especially high among elderly people (Fig. 1.6).

There has been a large increase of adenocarcinoma of the esophagus in many developed countries, compared with a decrease of squamous cell carcinoma. Rates of adenocarcinoma have been increasing in the USA, United Kingdom, Scandinavia, France, Switzerland, Denmark, Italy, Slovakia, the Netherlands (restricted to males), Australia, and New Zealand [2–4]. This might be partly due to a diagnostic shift; tumors arising in the cardio-esophageal junction are classified with gastric cardia tumors; an increase in esophageal adenocarcinoma

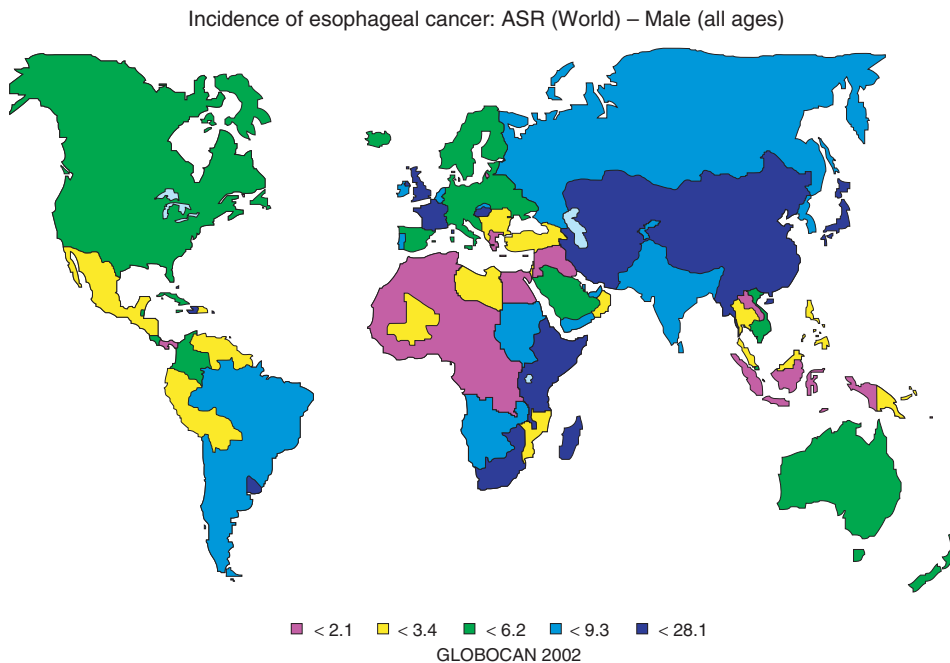


Fig. 1.3 Incidence of esophageal cancer in males, 2002, worldwide.

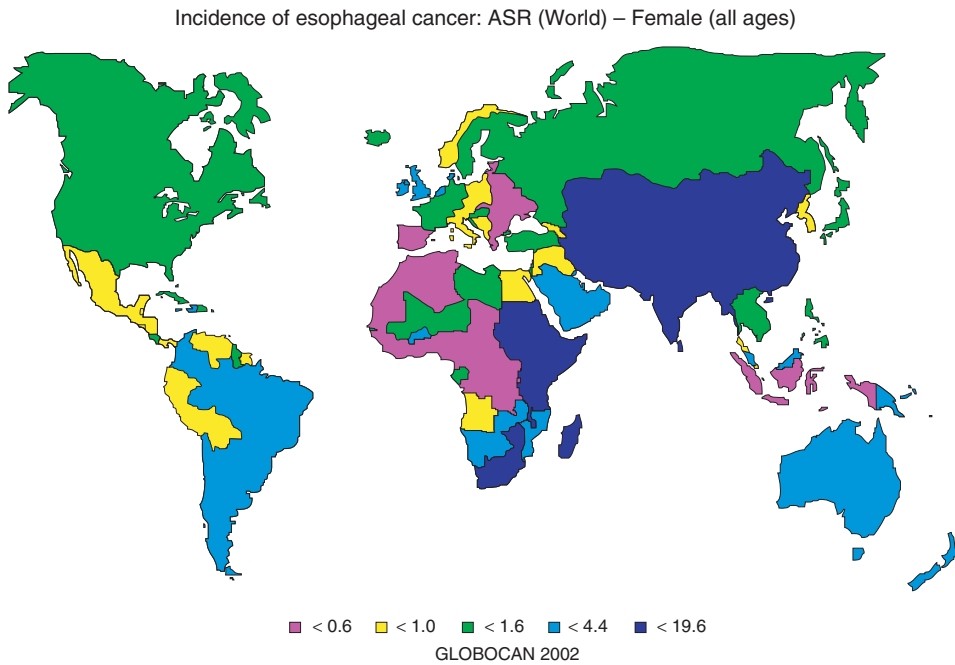


Fig. 1.4 Incidence of esophageal cancer in females, 2002, worldwide.

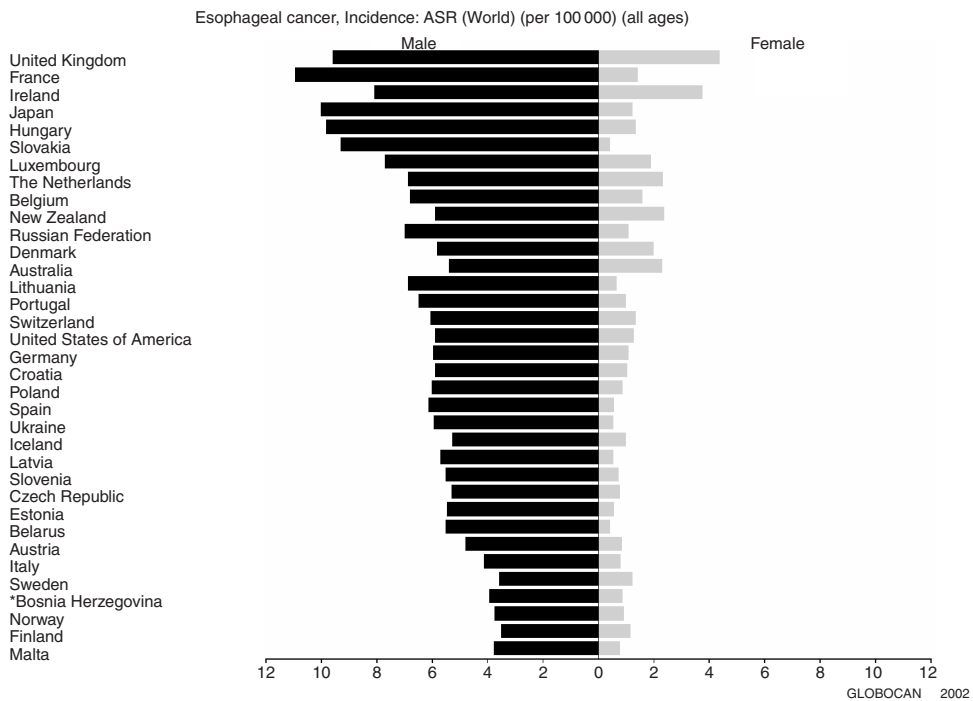


Fig. 1.5 Incidence of esophageal cancer in 2002, by country and gender.

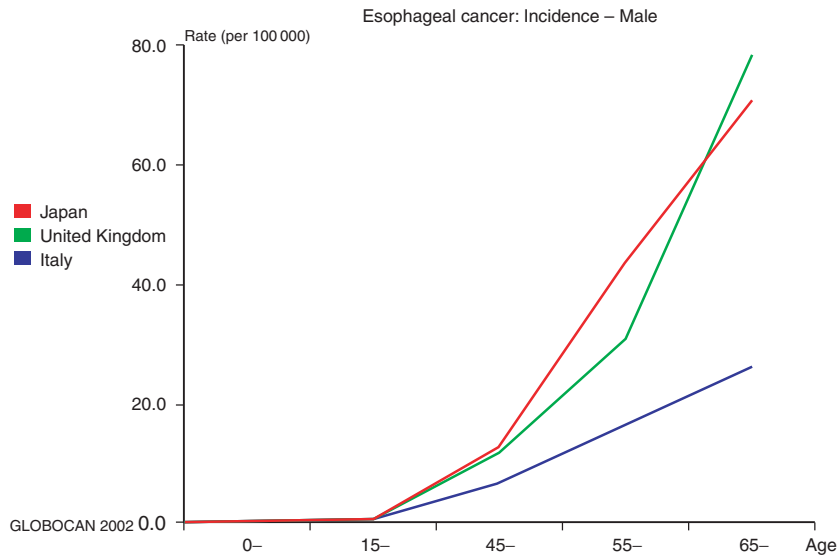


Fig. 1.6 Incidence of esophageal cancer in 2002, by age, among males in three selected countries.

could appear if tumors at or near the junction were identified increasingly as being esophageal in origin. However, gastric cardia rates would then diminish to a similar extent, which has not occurred. Rates may increase with earlier endoscopy-based diagnosis, but the stage distribution has not changed over time, and survival consistently has been poor, even for patients diagnosed with localized disease. These observations suggest that the increase of adenocarcinoma of the esophagus is real and reflects changes in the prevalence of risk factors [2].

Mortality from esophageal cancer showed the same patterns as the incidence (Figs 1.7, 1.8, and 1.9). Due to the increased incidence and the very limited improvements in survival of people with esophageal cancer, mortality rates have been increasing in most countries.

### Stomach cancer

The incidence of stomach cancer in 2002 was highest in northern Asia, including China and Japan, eastern Europe, southern Europe, and eastern South America. Lowest rates were found in Africa and Indonesia (Figs 1.10 and 1.11). Among developed countries, rates were by far the highest in Japan, and lowest in the USA (Fig. 1.12). Stomach cancer was more common among males than among females. Already by middle age, in Japan the incidence of stomach cancer is much higher compared to, for example, the USA or Italy (Fig. 1.13).

While there has been a marked decline in distal, intestinal-type gastric cancers (especially among females), the incidence of proximal, diffuse-type

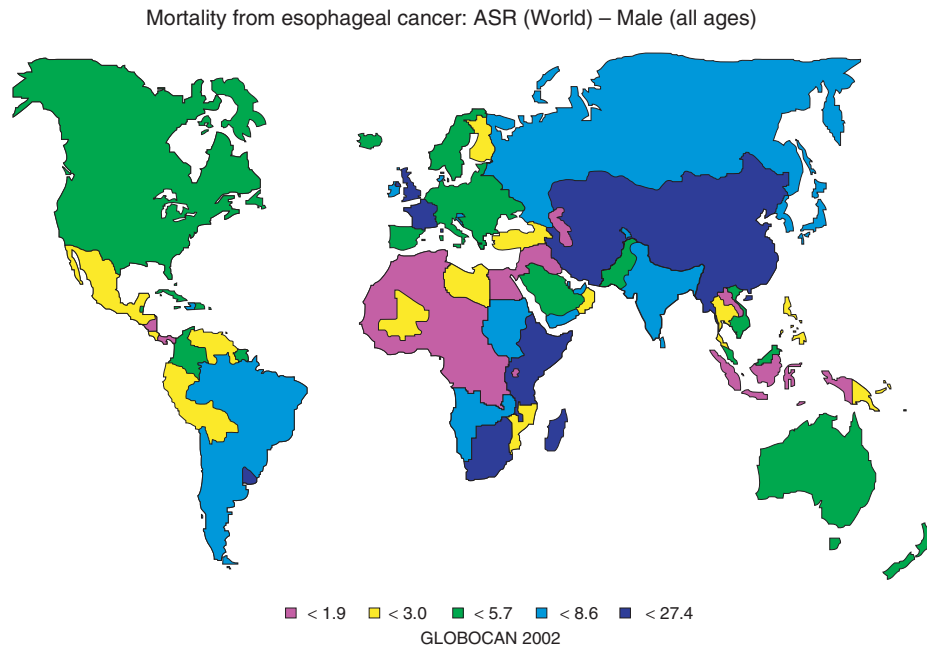


Fig. 1.7 Mortality from esophageal cancer in males, 2002, worldwide.

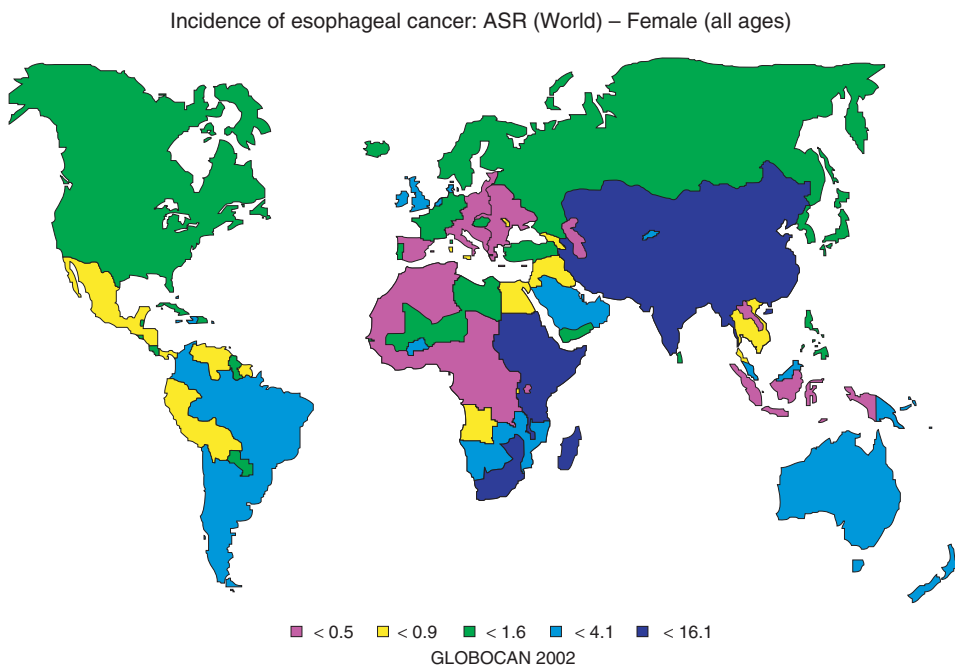


Fig. 1.8 Mortality from esophageal cancer in females, 2002, worldwide.

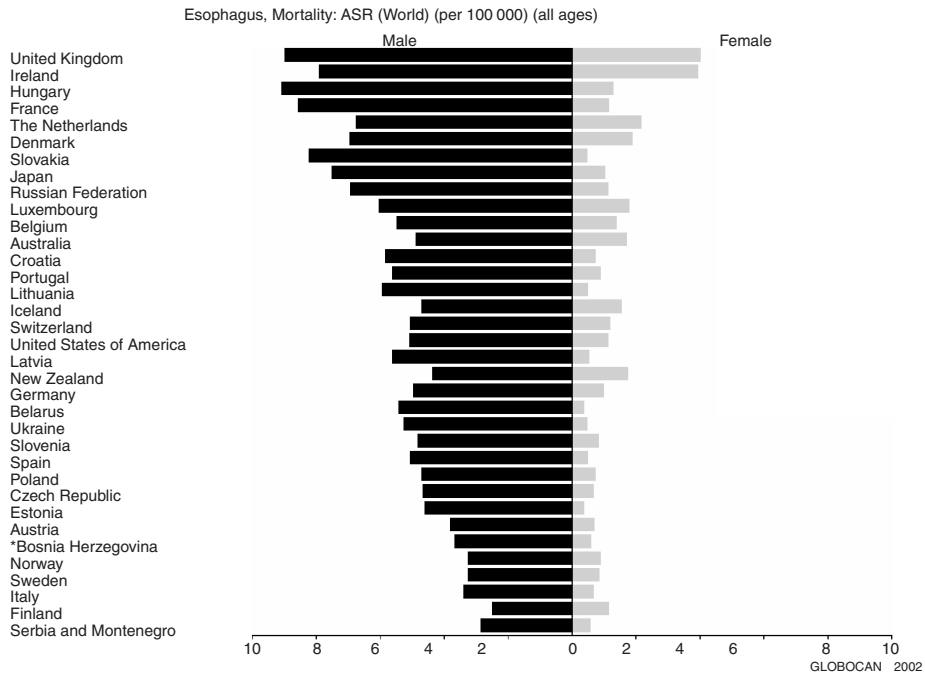


Fig. 1.9 Mortality from esophageal cancer, 2002, by country and gender.

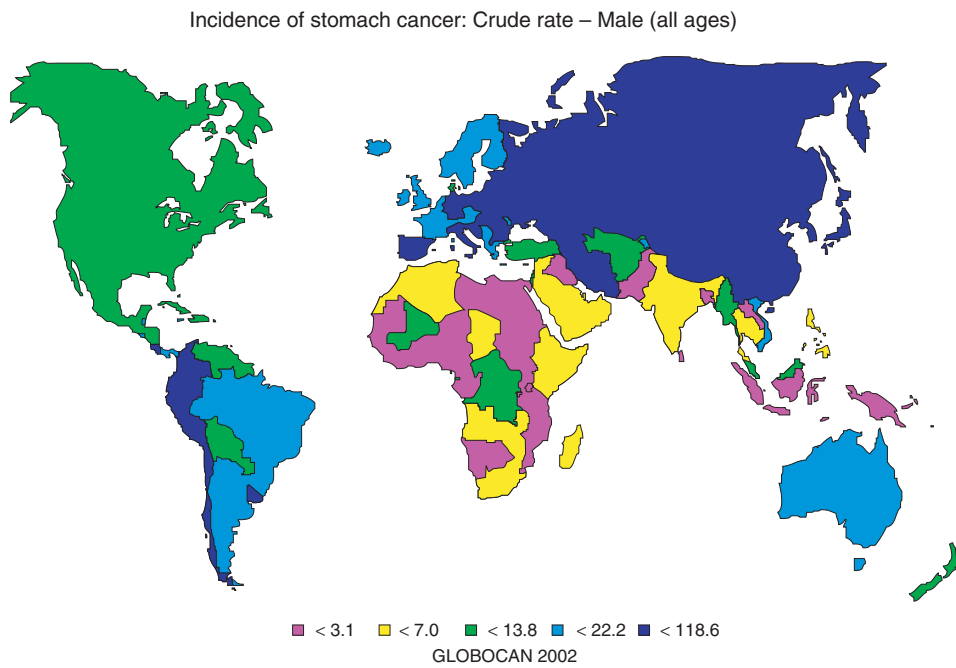


Fig. 1.10 Incidence of stomach cancer in males, 2002, worldwide.

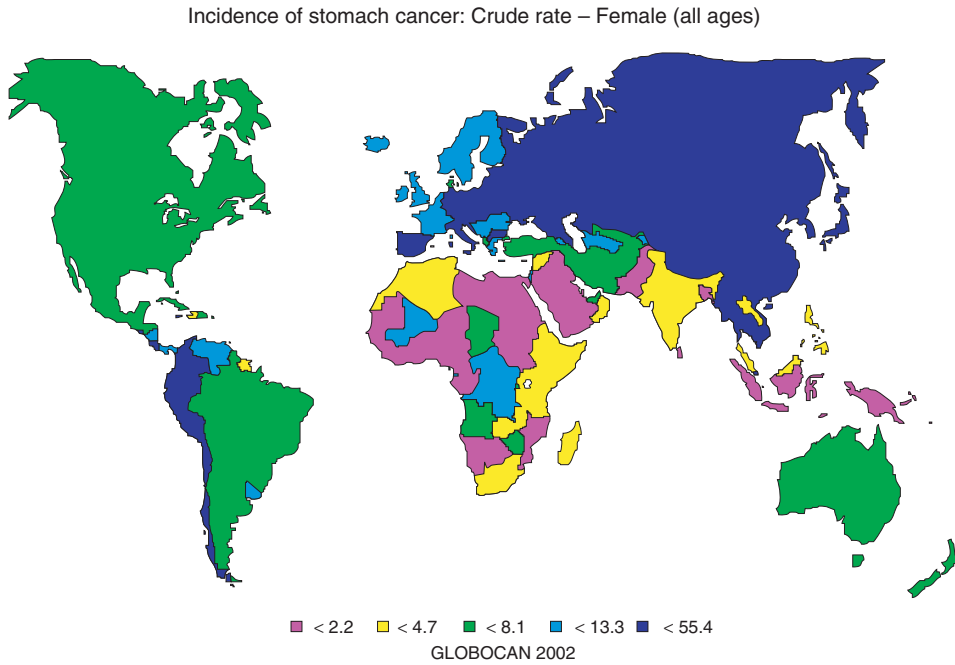


Fig. 1.11 Incidence of stomach cancer in females, 2002, worldwide.

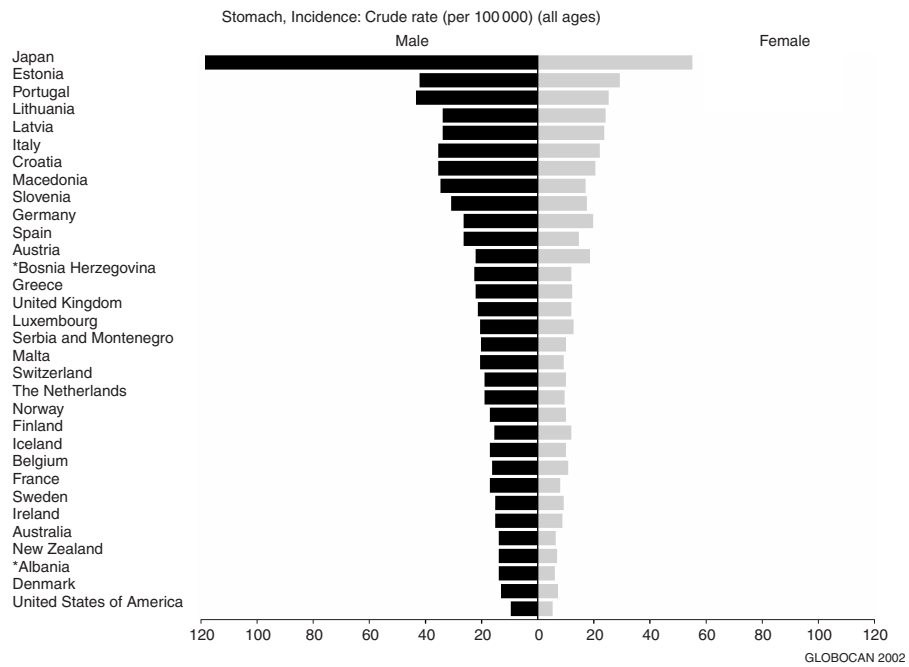


Fig. 1.12 Incidence of stomach cancer in 2002, by country and gender.

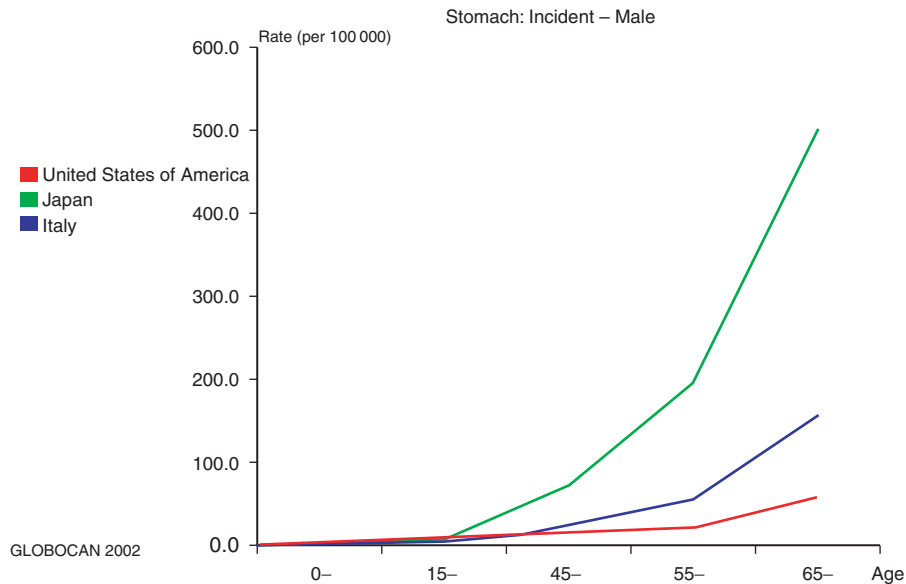


Fig. 1.13 Incidence of stomach cancer in 2002, by age, among males in three selected countries.

adenocarcinomas of the gastric cardia has been increasing, particularly in Western countries. Incidence by tumor subsite also varies widely based on geographic location, race, and socio-economic status. Distal gastric cancer predominates in developing countries, among black people, and in lower socio-economic groups, whereas proximal tumors are more common in developed countries, among white people, and in higher socio-economic classes. Diverging trends in the incidence of gastric cancer by tumor location suggest that they may represent two diseases with different etiologies [5].

Over the past few years, gastric cancer mortality has decreased markedly in most areas of the world. However, gastric cancer remains a disease of high mortality, second only to lung cancer as the leading cause of cancer-related death worldwide (Figs 1.14 and 1.15).

Availability of screening for early detection in high-risk areas has led to a decrease in mortality. In Japan, mortality rates for gastric cancer in men have halved since the introduction of screening in the 1970s [5]. Mortality rates in 2002 were lower in Japan than in some eastern European countries (Fig. 1.16).

## Colorectal cancer

The incidence of colorectal cancer showed a different picture than the incidence of esophageal or stomach cancer. Colorectal cancer is predominantly a cancer

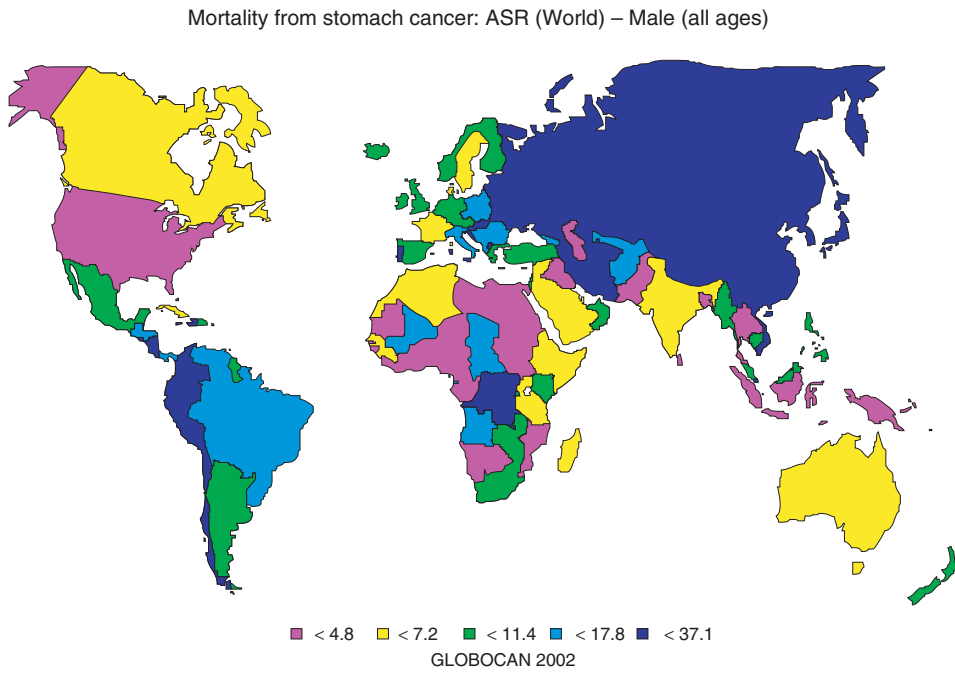


Fig. 1.14 Mortality from stomach cancer in males, 2002, worldwide.

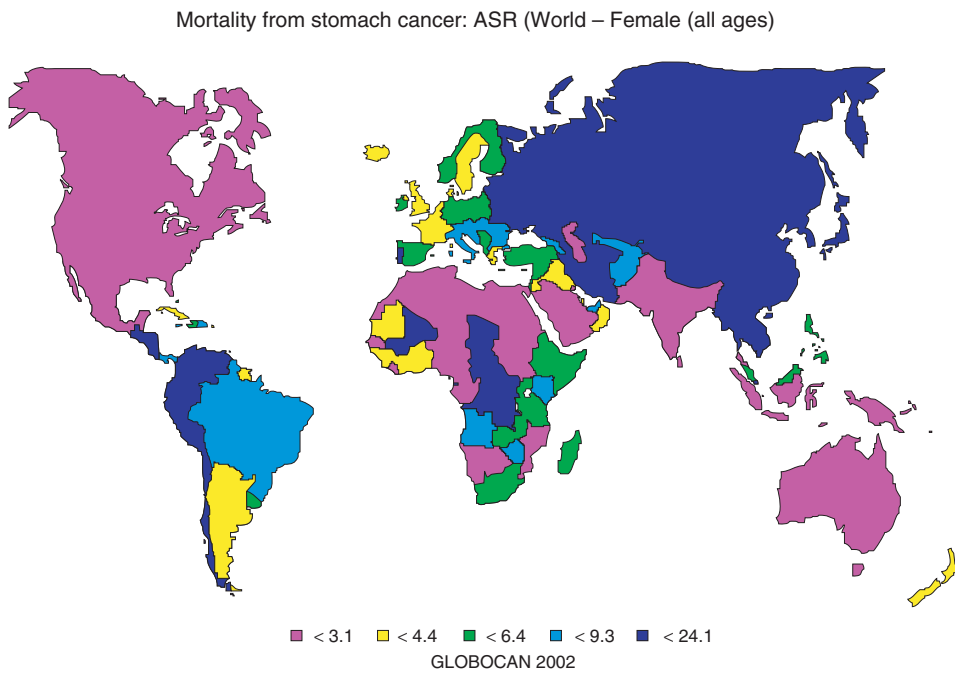


Fig. 1.15 Mortality from stomach cancer in females, 2002, worldwide.



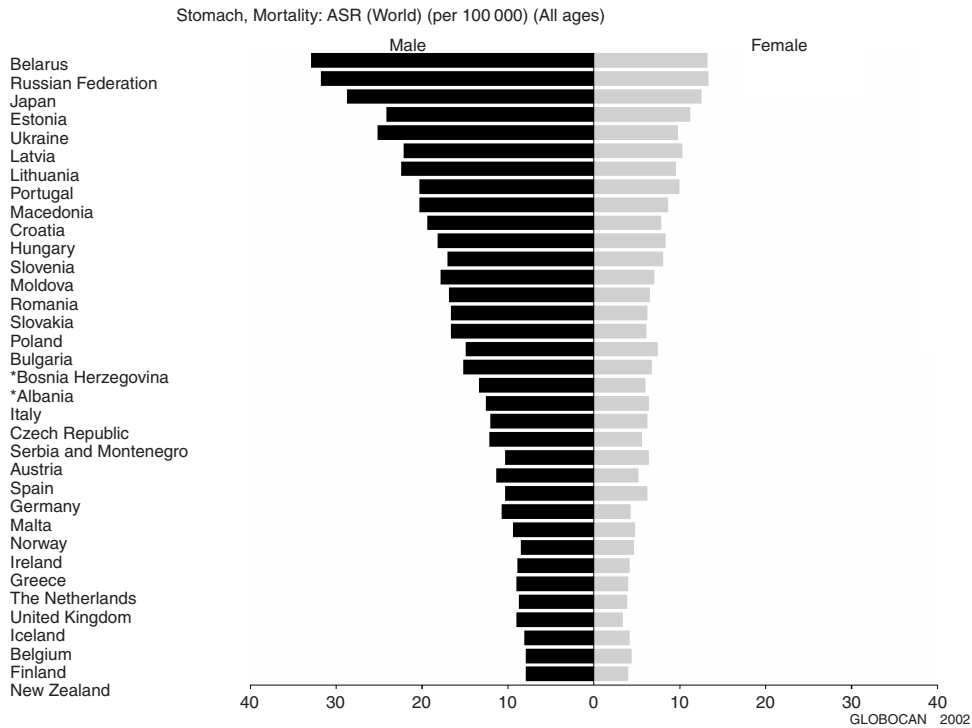


Fig. 1.16 Mortality from stomach cancer in 2002, by country and gender.

of the developed world. It was most common in 2002 in Europe, the USA, and Australia, for both males and females (Figs 1.17 and 1.18). It was somewhat more frequent among males than among females. The highest incidence was found in Germany, Hungary, Japan (especially males), the Czech Republic, and Norway (especially females), while the lowest rates in the Western world were found in the Ukraine and in Greece (Fig. 1.19).

Colorectal cancer in all countries is predominantly a disease of elderly people.

While the incidence rates in the USA and Canada have been stable for two decades, incidence is still increasing in many European countries, especially among men. In many countries, a shift toward more proximal tumors has been noted [6–10]. Exposure to changing risk factors is probably the cause of this shift. Also the male-to-female rate ratio progressively increased from the proximal colon to the distal colorectum, and the ratio of proximal-to-distal colorectal cancer gradually increased with advancing age [11].

Colorectal cancer mortality showed the same patterns as colorectal incidence (Figs 1.20 and 1.21). Mortality was highest in Hungary, the Czech Republic, and Slovakia (Fig. 1.22). A favorable pattern in colorectal cancer mortality for both genders was observed in most European countries from the 1990s onward.

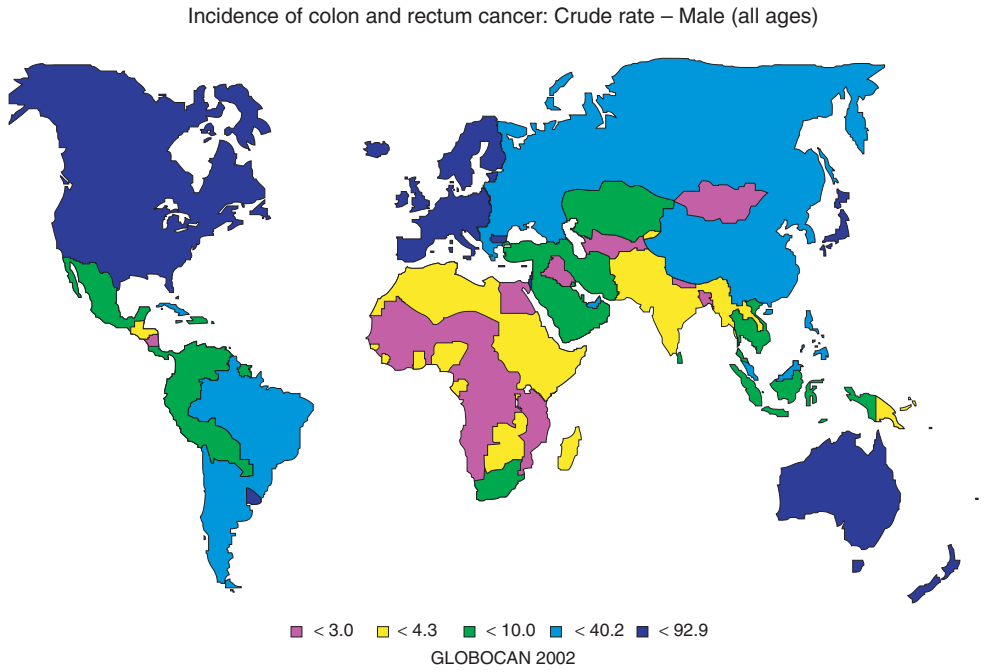


Fig. 1.17 Incidence of colorectal cancer in males, 2002, worldwide.

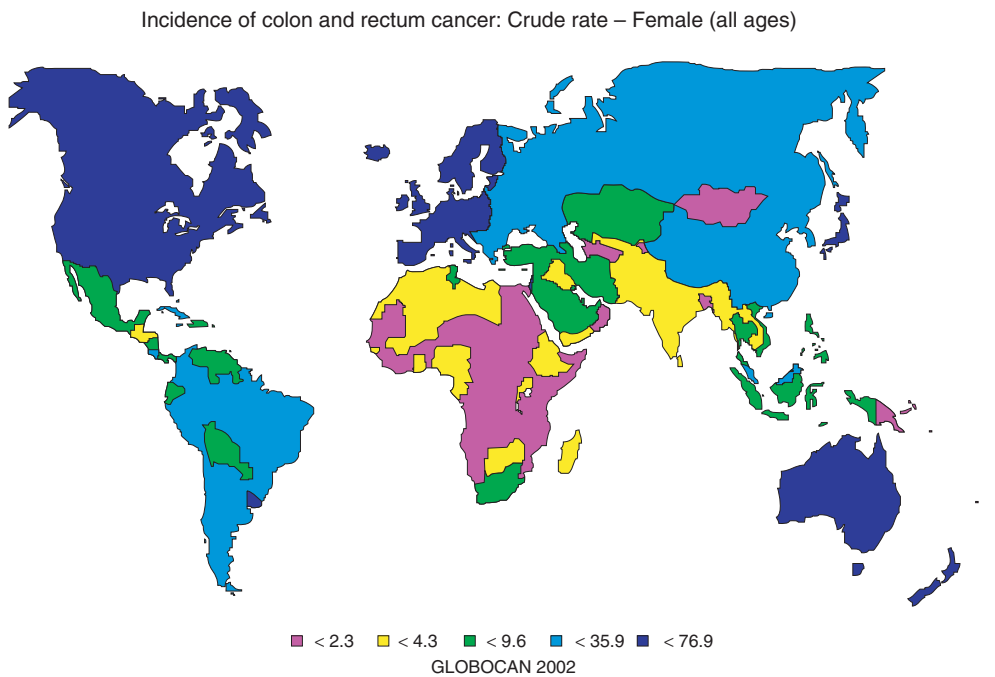


Fig. 1.18 Incidence of colorectal cancer in females, 2002, worldwide.

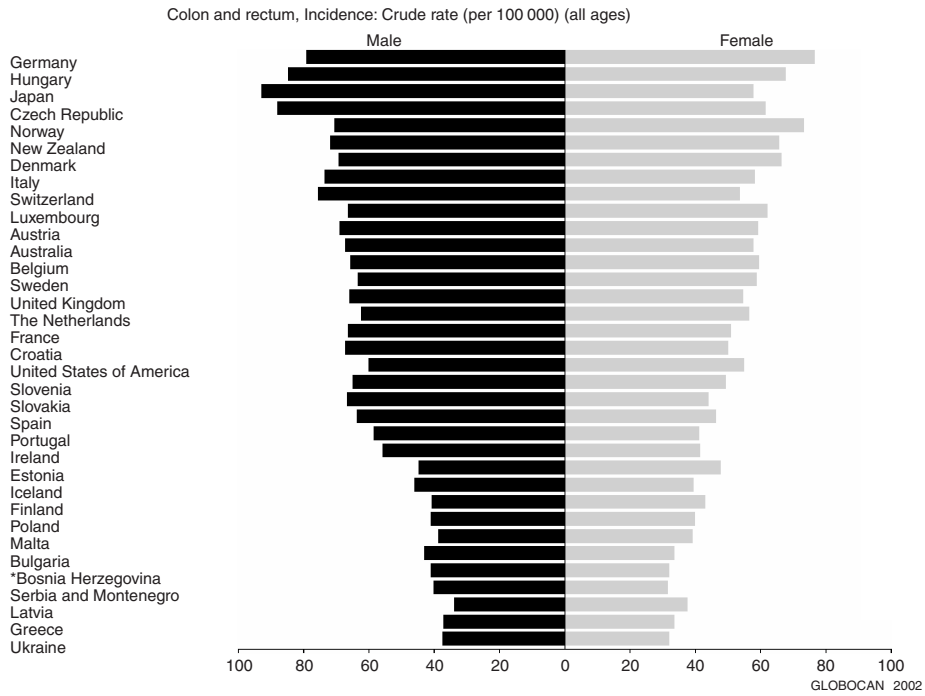


Fig. 1.19 Incidence of colorectal cancer in 2002, by country and gender.

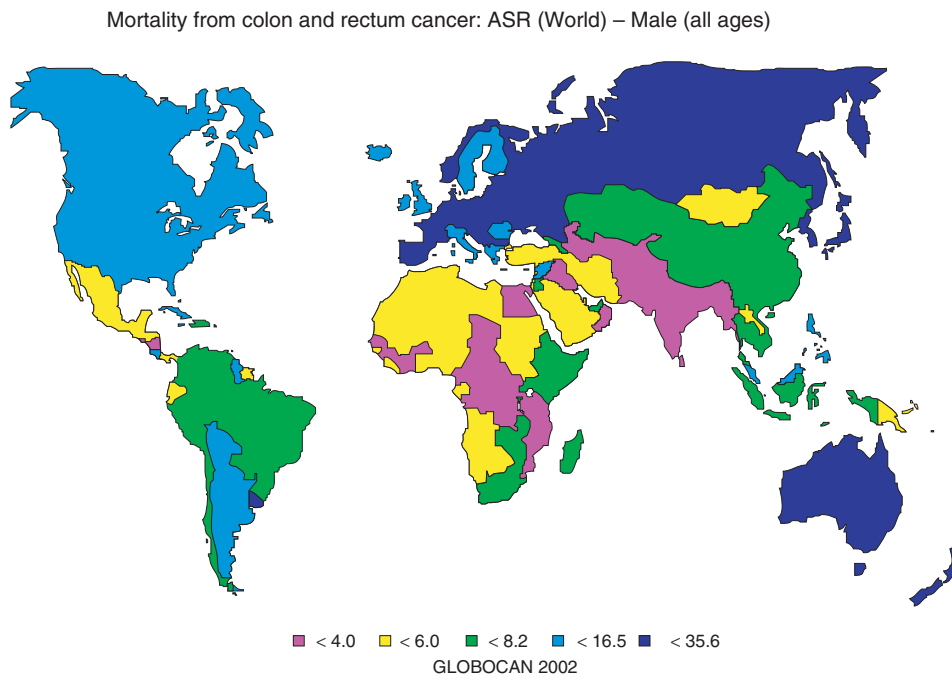


Fig. 1.20 Mortality from colorectal cancer in males, 2002, worldwide.

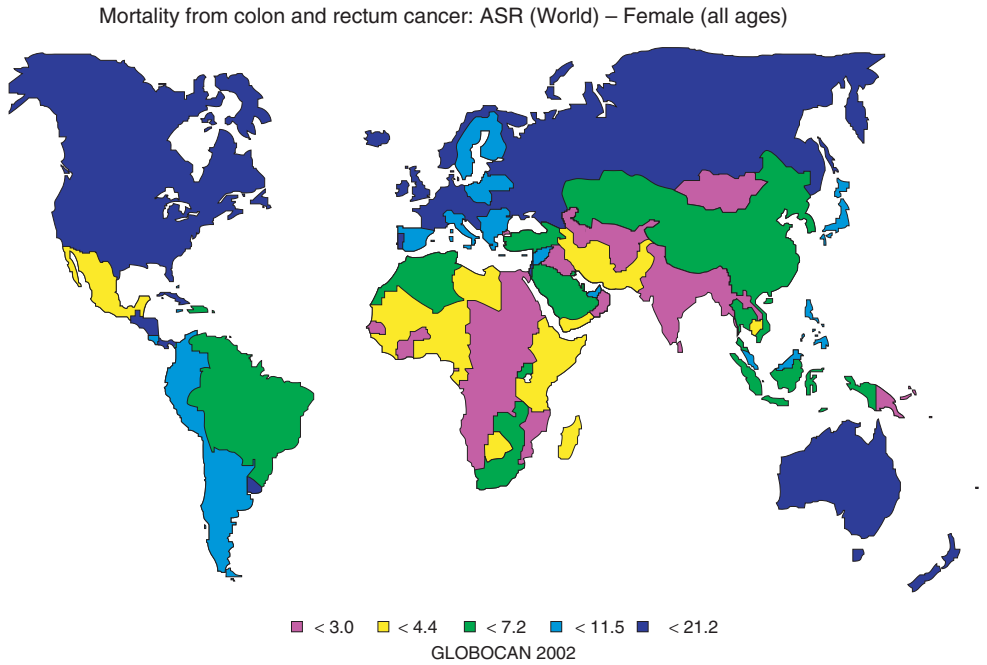


Fig. 1.21 Mortality from colorectal cancer in females, 2002, worldwide.

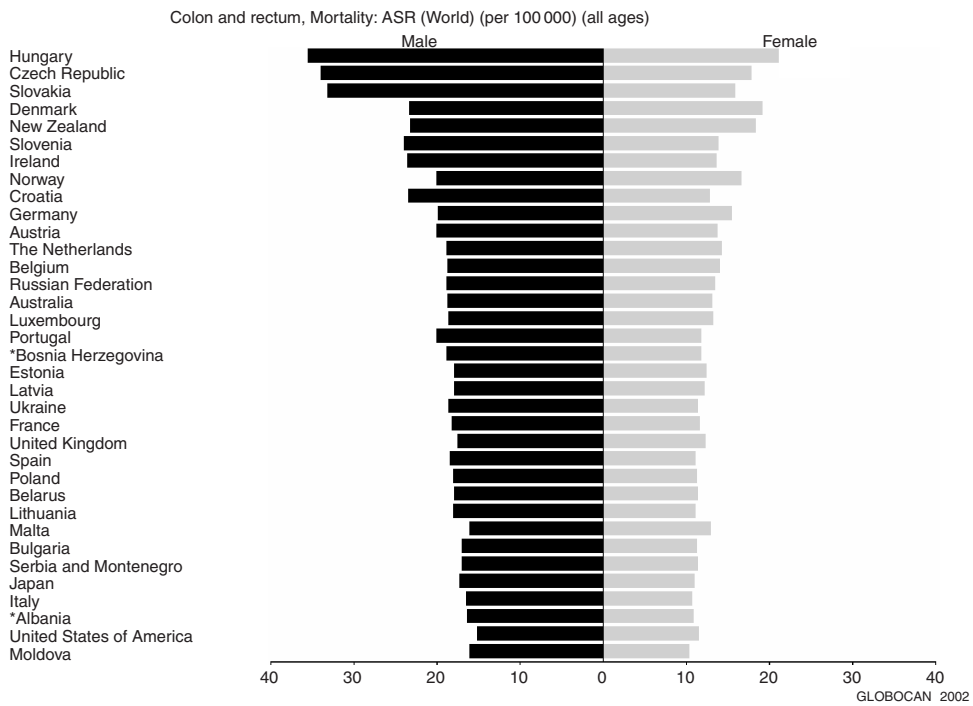


Fig. 1.22 Mortality from colorectal cancer in 2002, by country and gender.

Lower incidence rates, earlier detection, and improvements in treatment were responsible for this. Colorectal cancer mortality rates were still in the upward direction in some eastern European countries, as well as in some Mediterranean countries. Mortality rates tended to converge, a pattern even clearer when colorectal mortality rates were examined in three broad European regions. Similar mortality rates over recent calendar years have been reached by countries where mortality has been decreasing in recent decades, and in those countries (mainly eastern European and Mediterranean countries) which have experienced a recent leveling-off and decrease [12].

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