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MOTHERS' HEALTH: MORTALITY AND MORBIDITY ASSOCIATED WITH CHILDBEARING

6. MOTHERS' HEALTH: MORTALITY AND MORBIDITY ASSOCIATED WITH CHILDBEARING

CORE

Maternal mortality ratio (C6)

RECOMMENDED

Maternal mortality by cause of death (R5)
Incidence of severe maternal morbidity (R6)
Incidence of tears to the perineum (F7)

Each year more than 5 million women give birth in the EU. Another 2 million have failed pregnancies — spontaneous and induced abortions as well as ectopic pregnancies. Maternal mortality is a major marker of health system performance, and overall each year from 335 to 1000 women die in Europe during and because of pregnancy or delivery. Maternal mortality results from severe obstetric complications and conditions that occur more frequently but without such catastrophic results. This maternal morbidity is not adequately measured, however, mainly because there is no international agreement about the definition of the conditions and thus about methods for estimating their prevalence. In high income countries, maternal health has received less scientific attention in recent years than the health of babies. The Euro-Peristat group nonetheless agreed that indicators of maternal health were indispensable, and we included them in this project.[1]

This category includes 4 indicators of maternal mortality and morbidity. The 2 indicators of maternal mortality, that is, maternal mortality ratios and obstetric causes of death, are well constructed. The situation is very different for severe maternal morbidity — an indicator that has no widely agreed definition. It has nonetheless come to be seen in recent years as highly informative and important.[2] The Euro-Peristat project has developed a definition of this indicator and assessed the feasibility of collecting the relevant data. Although few countries can provide good quality data about this indicator,[3] it has been retained in the Euro-Peristat list and ongoing work is exploring the extent to which hospital discharge data can be used to improve national capacities for reporting the specific conditions and procedures that are included in our indicator. Finally, this chapter also includes an indicator on tears to the perineum; third- and fourth-degree tears are associated with substantial morbidity, and variations in this indicator are considered to reflect, in part, the quality of care during delivery.[4]

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C6 MATERNAL MORTALITY RATIO

JUSTIFICATION

Although maternal mortality in Europe has decreased to a very low level, healthy young women are dying from obstetric causes, up to half of which are potentially avoidable. The maternal mortality ratio (MMR) — the number of maternal deaths per 100 000 live births — is a proxy for the probability that a woman will die during a single pregnancy. Although numbers are low in smaller countries, maternal deaths in Europe are sentinel events that raise questions about the administration of effective care and the avoidance of substandard care.[1]

Beyond providing statistics, studying the circumstances that surround maternal mortality and the chain of events that led up to each death helps to prevent these avoidable deaths in the future. These investigations serve as a powerful tool for identifying weaknesses in the provision of care and recommending improvements to health policy makers.[1-3] Routine statistics and confidential enquiries are essential for estimating the frequency of maternal deaths, as sentinel events, and for investigating the circumstances of each. All European countries have routine statistics from national civil registration and cause-of-death data systems, but fewer have designed confidential enquiries or enhanced systems. Confidential enquiries into maternal deaths are conducted in some European countries, with especially strong traditions in the United Kingdom, France, and the Netherlands.[2-4]

Enhanced systems for reporting maternal deaths are necessary because routine systems generally underestimate the numbers of maternal deaths.[5,6] Some enhanced systems improve on routine systems by linking data sources, for example, deaths with births, for a more complete ascertainment of deaths associated with pregnancy. In the 2010 Euro-Peristat data collection exercise, information was requested from routine systems as well as from confidential enquiries and other enhanced systems, where they exist.

DEFINITION AND PRESENTATION OF INDICATOR

Maternal death is defined as the death of a woman while pregnant or within 42 days of the termination of pregnancy, irrespective of the duration and site of the pregnancy, for any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. The MMR is thus the number of all maternal deaths from direct and indirect obstetric causes per 100 000 live births. Our definition of maternal death is that published by WHO: a special chapter (10.3) of the 10th revision of the International Classification of Diseases (ICD-10) is devoted to the obstetric causes of death.[7] Because the number of deaths each year is so low in most countries, we used data covering a 5-year period (2006 to 2010).

DATA SOURCES AND AVAILABILITY

Data came from routine and enhanced systems for recording maternal deaths.

- Routine systems are those most generally available in each member state or country; the data are generally extracted from national civil registration and cause-of-death data systems, in which deaths are coded according to ICD-10. All EU countries except Greece, Ireland, and Norway contributed data, as did Iceland and Switzerland. In the Czech Republic, data come from a register of parturients only and therefore maternal deaths in pregnancy or after delivery are not included.
- Enhanced systems vary by country and may use different inclusion criteria from routine systems and from each other. Data were provided by Estonia, France, the Netherlands, Portugal, Slovenia, and the United Kingdom.

METHODOLOGICAL ISSUES IN THE COMPUTATION, REPORTING, AND INTERPRETATION OF THE INDICATOR

The first major difficulty in reporting maternal mortality is that maternal deaths are generally under-reported, so much so that WHO has proposed systematically weighting the official statistics reported by developed countries by a factor of 1.5.[8] In Europe, underestimation of maternal deaths varies from 30% to 50%, depending on the initial level recorded in the routine national cause-of-death records.[5] Because the WHO coefficient assumes the same level of under-reporting everywhere, we do not apply it. Instead, we provide data from enhanced systems as well as published studies, where these exist, to illustrate the extent of under-reporting. In some cases, however, enhanced systems have wider inclusion criteria, especially for indirect and late maternal deaths. For example, data from the UK confidential enquiry system suggest that there is minimal under-reporting of direct maternal deaths in the routine system, but the confidential enquiry has a wider remit in investigating indirect and late maternal deaths.[2]

A second difficulty comes from the small numbers recorded and the resulting statistical variation. To address the difficulties related to the low numbers of deaths, maternal mortality ratios were calculated with data for the 5 years 2006-2010 and 95% confidence intervals are presented to illustrate the uncertainty arising from the small numbers of deaths in some countries. Even with data for 5 years, however, the numbers of deaths are still very low in the smallest countries. For example, only 2 deaths were registered in Malta in the years 2006-2010. It has about 4000 live births a year, for a MMR of 9.9 per 100 000 live births. This does not necessarily mean that Malta has a high maternal mortality ratio or even that its ratio has risen; if Malta had the average European MMR — about 6.2 per 100 000, we would expect 0.5 maternal deaths per year or one every 2 years. There is a high probability that no maternal deaths would occur at all in any given year or even in any 2-year period. This was the case in 2003-2004, the period covered in the last Euro-Peristat report when no death was recorded in Malta.

Finally, since obstetric causes can be attributed to deaths occurring after the 42-day limit specified in the definition, data provided by some countries to Euro-Peristat may include late maternal deaths more than 42 days after delivery but coded as having an obstetric cause. There may well be differences in the extent to which indirect maternal deaths are included.

RESULTS

The total number of maternal deaths officially recorded in routine systems varied from none in Iceland and less than 1 per year in Cyprus, Estonia, Luxembourg, and Malta to more than 40 in France, Romania, and the United Kingdom, as shown in Figure 6.1. Among the countries reporting data for 5 years, the highest ratios were observed in Latvia with 24.5 per 100 000 live births and Romania with 21.0 compared with 2.5 in Italy, 2.6 in both Austria and Estonia, and 2.9 in Poland. All these ratios differ significantly from the overall level of 6.2 per 100 000 for all participating countries combined (Figure 6.1).

Six countries provided data from enhanced systems (Figure 6.2). These showed wide differences in enhanced MMRs, some of which may have been due to differences in inclusion criteria, especially for indirect and late maternal deaths. In 2 of them, Estonia and Slovenia, the maternal mortality ratios reported from the enhanced systems were identical to those from the routine systems. In contrast, enhanced ratios were higher than those from routine systems in the United Kingdom, the Netherlands, Portugal, and France. The Portugese data for the enhanced system are from 2003-2007; over this period the routine MMR was 5.4 per 100 000 live births. Other countries

have undertaken studies to investigate the completeness of their maternal mortality ratios and have also found them to be substantially higher than those reported in routine systems: 5.9 per 100 000 over the period 1988-2007 in Sweden,[9] 8.0 per 100 000 for the period 2002-2006 in Denmark,[10] and 11.8 per 100 000 between 2000 and 2007 in a set of Italian regions.[11] The Euro-Peristat project used its 2004 data to conduct a review of results from the enhanced systems and specific studies (including those from Italy, Austria, and Finland); this study confirmed that routine systems ascertained fewer deaths.[5] It also found that countries with enhanced systems had higher maternal mortality ratios reported from routine systems, probably reflecting greater awareness of the problems of recording these deaths.

Compared to the ratios from the 2003-2004 data from routine systems in the previous Euro-Peristat report, those for 2006-2010 were lower in 14 countries (including Flanders, the Czech Republic, Estonia, and Spain), but the decreases were not statistically significant. The maternal mortality ratios increased in 8 countries. The overall level of 6.2 per 100 000 live births for the EU as a whole was the same.

Figure 6.3 presents MMRs by maternal age group (2003-2004 and 2006-2010). In view of the small numbers, we pooled the data from contributing countries and focused on 3 age groups: younger than 25 years, 25-34 years, and 35 years and over. This figure illustrates the association between maternal age and maternal mortality. The MMR for women aged 35 years or older is about twice as high as that for women aged 25-34 years and 3 times higher than for those younger than 25.

KEY POINTS

The MMR is low (less than 10 per 100 000) in the majority of countries, but this is generally an underestimation. There is good evidence that maternal deaths derived from routine statistical systems are under-reported, and this must be suspected particularly where ratios are very low. Confidential enquiries and record linkage are recommended to obtain complete data on pregnancy-related deaths and also to make it possible to understand how these deaths happened and to make recommendations to prevent the recurrence of those that could have been prevented.

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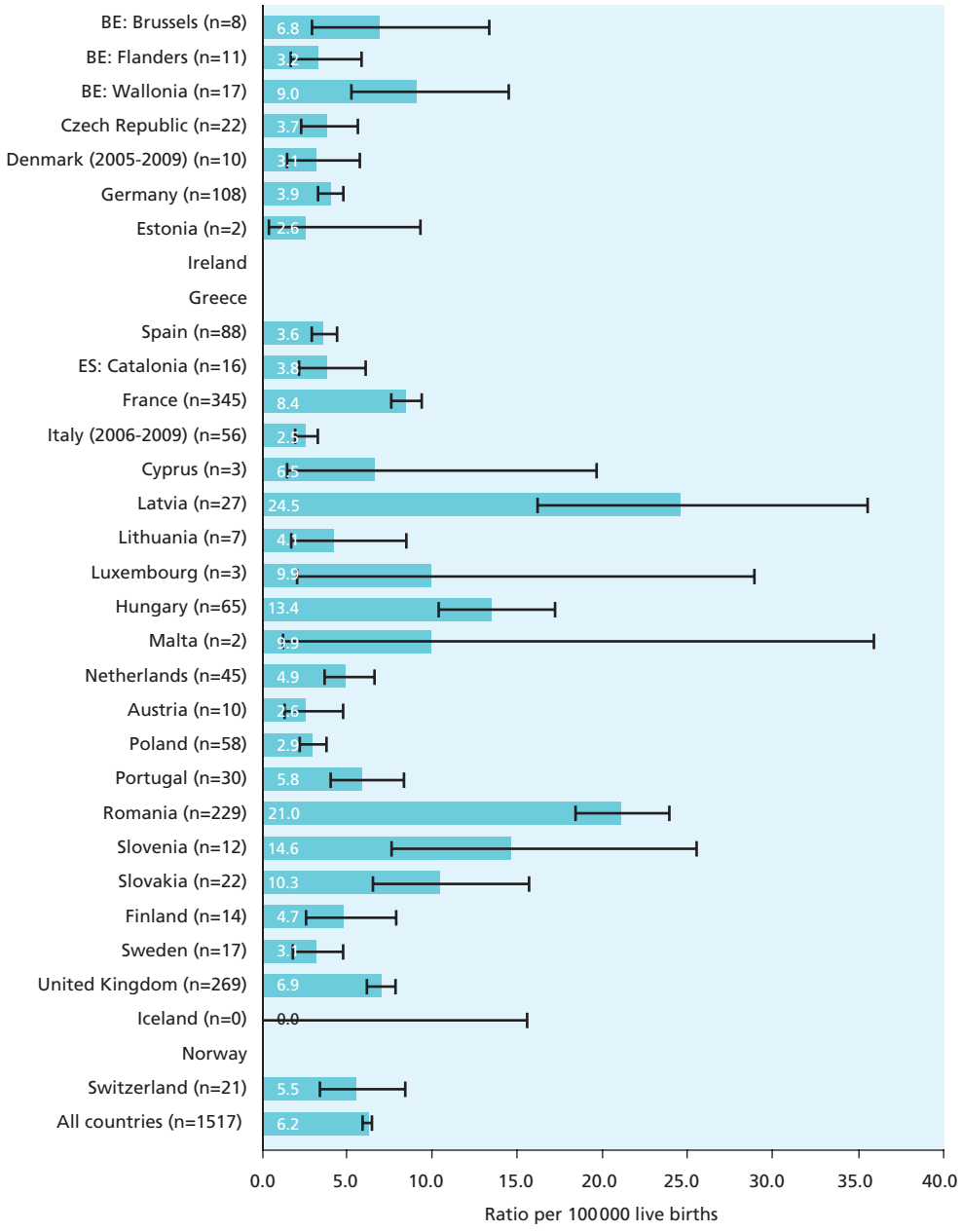
Figure 6.1 Maternal mortality ratio, 2006-2010



NOTE: ratios provided with 95% confidence intervals

Figure 6.2 Maternal mortality ratios from routine statistics and from enhanced systems, 2006-2010

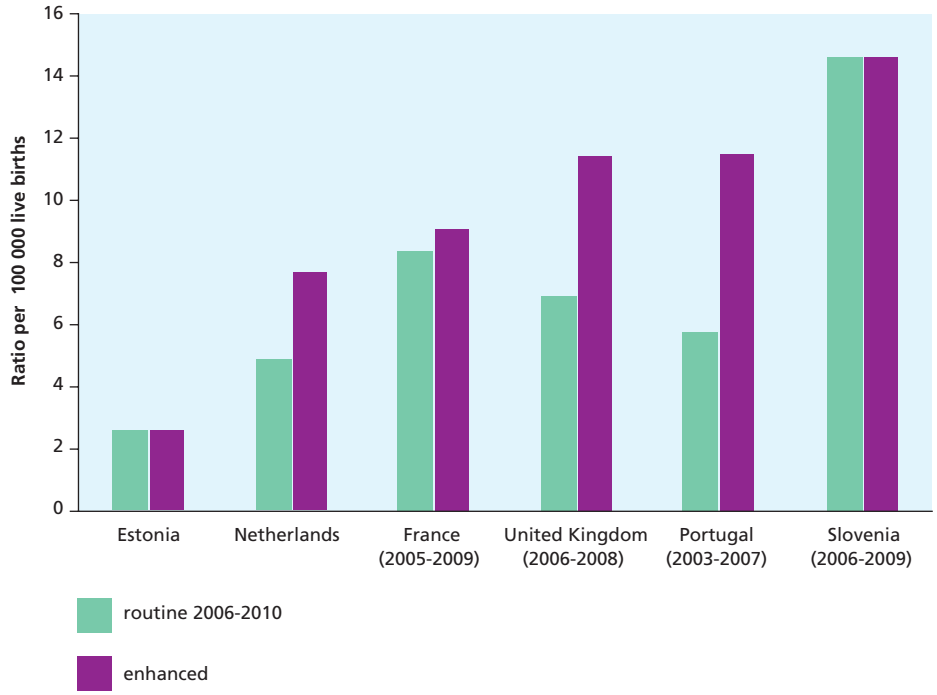
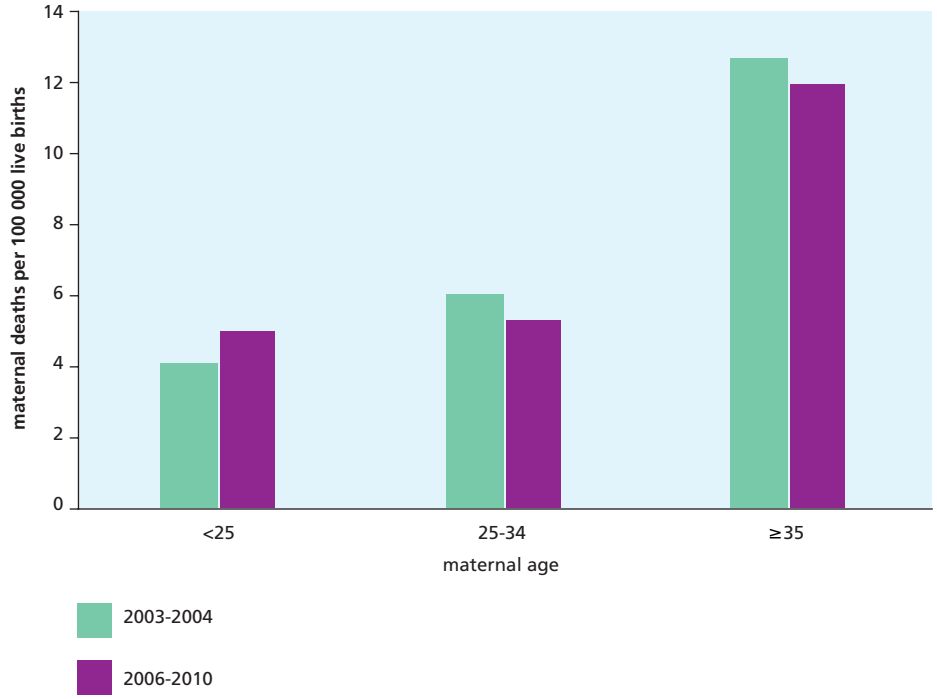


Figure 6.3 Maternal mortality ratios by maternal age in Europe in 2003-2004 and 2006-2010



R5 MATERNAL MORTALITY BY CAUSE OF DEATH

JUSTIFICATION

In addition to differences in the rates of mortality, causes of these deaths can vary across countries. An earlier European study, the European Concerted Action on Mothers' Mortality and Severe Morbidity (MOMS), found that patterns of causes and timing of death as well as age-specific mortality ratios varied between countries with different levels of MMR.[1] In countries with higher MMRs, a higher proportion of deaths resulted from haemorrhages and infections, whereas hypertensive disease and indirect obstetric deaths formed a higher proportion of the deaths in countries with lower MMRs. Deaths from infections and haemorrhages were more often associated with substandard care.

DEFINITION AND PRESENTATION OF INDICATORS

Because of the small number of deaths in each country, we did not compute MMRs by individual causes of death. Instead we calculated the proportion of each specific cause by taking the number of deaths attributed to each category of causes as a percentage of total maternal deaths. Countries were asked to report the number of deaths that corresponded to the ICD-10 codes for the following causes: abortions, ectopic pregnancy, hypertension, haemorrhages, chorioamnionitis/sepsis, amniotic fluid embolisms, other thromboembolic causes, anaesthesia complications, uterine ruptures, other direct obstetrical causes, indirect circulatory causes, other indirect obstetrical causes, and unknown causes. We also computed the specific maternal mortality ratios by causes at the European level from the national data provided (Figure 6.4).

DATA SOURCES AND AVAILABILITY

The availability of the data generally depends on the information written on death certificates and how it is coded by the organisation responsible for processing data from them. There are 2 sorts of limitations: firstly, the under-reporting of deaths associated with pregnancy described above and, secondly, a specific problem of application of the coding rules recommended by the WHO in the ICD. A maternal death is usually the consequence of a series of unexpected obstetric complications and possibly also adverse social circumstances that in combination lead to the death of a woman who is generally young and in good health. As a result, the choice of the underlying cause and therefore its coding to the appropriate digit code of the ICD is not easy and differs from one country to another.[2] For example, before 1998 in France, maternal deaths from pulmonary embolisms were classified in the ICD chapter on respiratory diseases and not in the chapter on complications of pregnancy. Studies have shown coding differences between some European countries.[3,4] A recent study from Sweden confirmed the existence of coding mistakes, in particular, related to pre-existing diseases; if information about pregnancy is not taken into account, the death cannot be coded as an indirect obstetric cause.[5]

Confidential enquiries are considered the best approach for improving the quality of information about the circumstances surrounding these events and thus the accuracy of the diagnosis and coding of the underlying cause of the death.[5-8]

RESULTS

Appropriate interpretation of the causes of maternal deaths requires particular attention to the proportion of unknown causes. The cause of maternal death was listed as unknown in 4% of EU cases, a decrease since the preceding report (16.4% in 2003-2004). But countries varied dramatically in their attribution of cases to this category, as seen in Summary Table R5. Nine

countries reported unknown causes: Estonia 50% (1/2), Germany 1% (1/89), Denmark 10% (1/10), Wallonia 18% (3/17), France 7% (24/345), Spain 3% (2/74), Sweden 6% (1/16), Romania 3% (6/229), and the United Kingdom 0.8% (2/266).

The general European profile of known direct obstetric causes of death, as presented in Figure 6.4, shows patterns similar to those in 2003-2004 and a general decrease in the specific ratios by cause, except for complications of the first trimester (0.18 for ectopic pregnancies and 0.45 for abortions) and hypertensive disorders (0.72 per 100 000, compared with 0.63 in 2004). Among direct obstetric causes, haemorrhage continues to contribute most to the MMR in the EU (0.87 per 100 000 live births), slightly less than in 2003-2004 (0.91), followed by hypertensive disorders. The change since 2004 is that third place is occupied by deaths due to first-trimester complications. This is the direct consequence of the high proportion of maternal deaths in Romania due to abortion — 20% (see Summary Table for R5 for breakdown by country). All other causes declined between the 2 periods, including indirect obstetrical causes (ratio of 1.08 per 100 000).

Among indirect causes, circulatory diseases ranked high, with a ratio of 0.42 per 100 000 live births. Of direct causes, haemorrhage accounted for around 15% of maternal deaths in participating countries, ranging from 4% in the Czech Republic to more than 30% in several countries. Complications of hypertension accounted for an average of 12% and amniotic fluid embolisms 7%. "Other direct obstetric causes" were reported as the cause of 19% of the maternal deaths in the EU.

KEY POINTS

In Europe today, maternal deaths occur in relatively small numbers, but an analysis of their causes is essential for developing strategies to prevent them. Surveillance of maternal mortality by conducting confidential inquiries helps to improve our understanding of healthcare systems and how they perform so that we can make recommendations to prevent these tragic events. Better and more uniform coding and recording of the causes of maternal deaths in European countries would facilitate comparisons between countries and improve our understanding of the sequences of events that can lead to maternal death.

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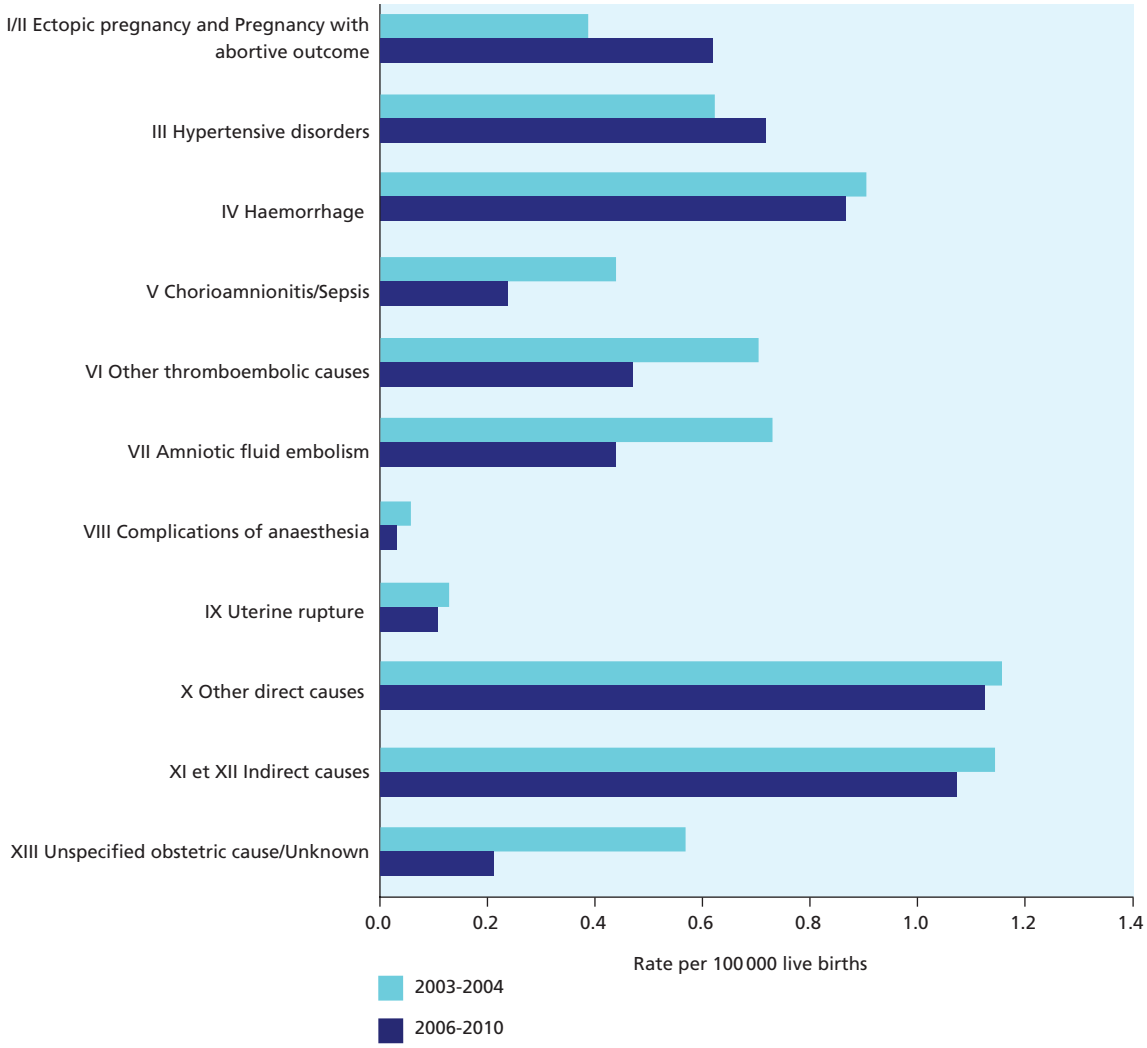
Figure 6.4 **Maternal mortality ratios by obstetric causes, data pooled from all national data provided for 2003-2004 and 2006-2010**



R6 INCIDENCE OF SEVERE MATERNAL MORBIDITY

JUSTIFICATION

Maternal mortality is the measure traditionally used to evaluate the status of women's health in pregnancy, but the welcome decline in mortality has given rise to concerns about the statistical power and validity of studies based on such small numbers. The rarity of maternal death in developed countries does not mean that pregnancy is a safe condition. For every maternal death, there are many serious, even life-threatening episodes of pregnancy complications. Severe maternal morbidity has been estimated to occur at rates ranging from 9.5 to 16 cases per 1000 deliveries throughout Europe, the United States, Canada, and Australia[1-5] and may be increasing over time.[2,5] There are no widely accepted definitions or inclusion criteria for defining severe maternal morbidity. The Euro-Peristat study set up a working group to conduct a review of potential maternal morbidity indicators, to propose a definition for Euro-Peristat, and to assess the availability of data to construct these morbidity indicators from hospital systems in participating countries. The definition adopted during the first phase of the project was made up of 4 indicators (eclampsia, hysterectomy, blood transfusion, and ICU admission). Embolisation was subsequently added as a fifth indicator.

Since Euro-Peristat began, maternal morbidity has become the focus of several research projects in Europe and elsewhere. An international network now links obstetric surveillance surveys (International Network of Obstetric Survey Systems, INOSS). A WHO working group proposed an international definition of severe maternal complications and life threatening events, and various approaches have been tested.[6,7] Nevertheless, for purposes of surveillance and despite problems with data availability and quality, routine hospital data can provide valuable information about severe maternal morbidity and efforts should continue to validate the data and improve their quality.[8]

DEFINITION AND PRESENTATION OF INDICATOR

The proposed Euro-Peristat indicator includes both management-based and disease-specific criteria. It is defined as the number of women experiencing any one of eclamptic seizures, caesarean hysterectomy, embolisation, blood transfusion, or a stay of more than 24 hours in an intensive care unit as a percentage of all women with liveborn and stillborn babies.

DATA AVAILABILITY

We had expected that these data about the incidence of embolisation, eclampsia, blood transfusion, and hysterectomy for postpartum haemorrhage would be easy to collect through hospital discharge systems. We know that most member states have financial systems that allocate funding to hospitals delivering care and consequently systems for recording the number of patients with conditions such as those included in our definition of severe maternal morbidity. Unfortunately data on these complications are not now routinely available from most of these systems.

RESULTS

Twenty-two countries or regions provided at least one of the components of the maternal morbidity indicator (see Summary Table for R6 in Appendix B). Only 5 provided information for all the categories, however. These were France, Germany, Poland, Norway, and Switzerland.

Eclampsia appears to be the condition which is most widely recorded. Twenty countries provided data, and only 5 have definitions which differed from our specification, but some countries had concerns about the accuracy of the data provided. The ratios range from 0.1 per 1000 women delivered (Finland, Sweden, and Scotland) to 0.9 (Latvia and France). Seventeen countries or regions provided data about hysterectomies, most with the same definition, although some were not able to separate hysterectomies associated with pregnancy and delivery from those related to other circumstances. The ratios ranged from 0.0 and 0.1 per 1000 women delivered (Wales and Sweden) to 1.2 and 1.3 per 1000 women (Latvia and Estonia). Data about transfusion were provided for 12 countries; embolisation for 12, and ICU admission for 8. Figure 6.5 presents rates for eclampsia and hysterectomy, the 2 complications most frequently reported by countries. It shows wide disparities between countries in these rates. Further investigation is required to understand these differences.

KEY POINTS

This is the third time that an attempt has been made to gather information about severe maternal morbidity at a European level from routine data collection systems. The only previous attempt to compare maternal morbidity in Europe involved a European Concerted Action that was limited to 14 countries and used a specific survey.[2] Our objective here was to make use of existing routinely collected hospital data, but our results show that these systems require further development before a comparable measure of maternal morbidity can be included in routine reporting at a European level.

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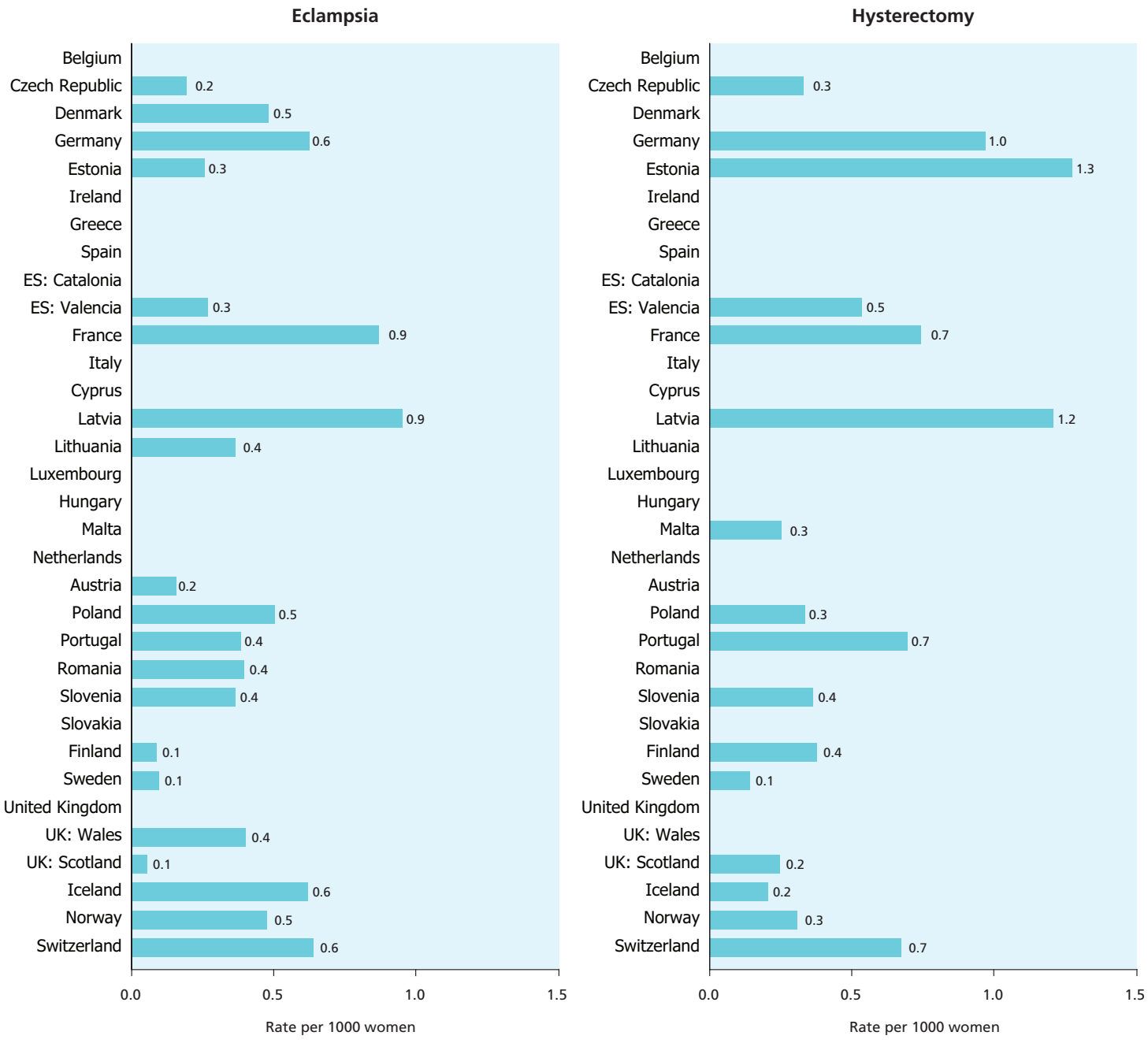
Figure 6.5 Maternal morbidity: rates of eclampsia and of hysterectomy for postpartum haemorrhage in 2010



R7 INCIDENCE OF TEARS TO THE PERINEUM

JUSTIFICATION

Vaginal births can be associated with some form of trauma to the genital tract, either as a consequence of tears or of episiotomy. The morbidity associated with perineal trauma is significant in the case of third- and fourth-degree tears.[1] Although policies of routine episiotomy have been advocated for reducing the incidence of severe vaginal tears, the evidence suggests that policies restricting use of episiotomy are more beneficial.[2] This indicator is designed to monitor the proportions of women with tears by degree of severity.

DEFINITION AND PRESENTATION OF INDICATORS

This indicator is defined as the percentage of women who delivered vaginally and had a tear, by its degree of severity.

DATA SOURCES AND AVAILABILITY OF INDICATORS IN EUROPEAN COUNTRIES

Most of the data came from hospital databases. Data about tears were available for Denmark, Germany, Estonia, the Valencia region of Spain, France, Cyprus, Latvia, Luxembourg, Malta, the Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Finland, Sweden, England, Wales, Scotland, Iceland, Norway, and Switzerland. Some of these did not have the full range of data requested. The data for Malta were restricted to the proportion of women with no tear, while Estonia, the Netherlands, and Sweden did not have data about first- and second-degree tears. Data for Estonia, France, Latvia, the Netherlands, and Norway were for third- and fourth-degree tears combined.

METHODOLOGICAL ISSUES IN THE COMPUTATION, REPORTING, AND INTERPRETATION OF THE INDICATOR

Although the percentage of vaginal deliveries with third- and fourth-degree tears is a well established indicator of the quality of maternity care, there are questions about variations in the completeness of reporting.[3] Although techniques have been developed to prevent third- and fourth-degree tears, the issues involved are complex, as factors including birthing positions, individual tissue quality, and the speed of labour all play a part.[1,4] Higher rates of tears are associated with operative vaginal delivery, compared to spontaneous vaginal delivery. These operative vaginal rates vary considerably between countries, as indicator C10 shows. Finally, this indicator applies only to women having vaginal deliveries, a percentage that ranges from only 47.8% of deliveries in Cyprus to 85.2% in Iceland (see C10).

RESULTS

The percentage of women with vaginal deliveries and reported to have no tear varied from over 95% in Estonia, the Netherlands, Austria, Poland, and Finland, to around half in England, Wales, Scotland, Malta, Norway, and Switzerland. The percentage of women with first- and second-degree tears ranged from 4% in Finland to 58% in Iceland. The proportion of women reported to have third- or fourth-degree tears ranged from 0.1% in Poland and Romania and 0.2% in Slovenia to over 4% in Denmark, the Netherlands, and Iceland.

Only Denmark, Germany, Estonia, Slovenia, Finland, England, Wales, and Scotland contributed data about vaginal tears in both 2004 and 2010. The proportions of women reported to have tears by degree of severity did not differ markedly. There were small increases in the proportions of women with severe tears, as in the countries of the UK, but these could reflect fuller reporting.

KEY POINTS

There were differences between countries in the percentage of women reported to have tears. These differences should be interpreted with caution as they are likely to be a consequence of variations in completeness of recording of tears, especially for first- and second-degree tears. Third- or fourth-degree tears were reported in from under 1% to over 4% of all deliveries in participating countries and can sometimes be associated with significant short or long-term problems for the woman. Although techniques have been developed to prevent third- and fourth-degree tears, the issues involved are complex, as factors including birthing positions, individual tissue quality, and the speed of labour all play a part.[1,4.]

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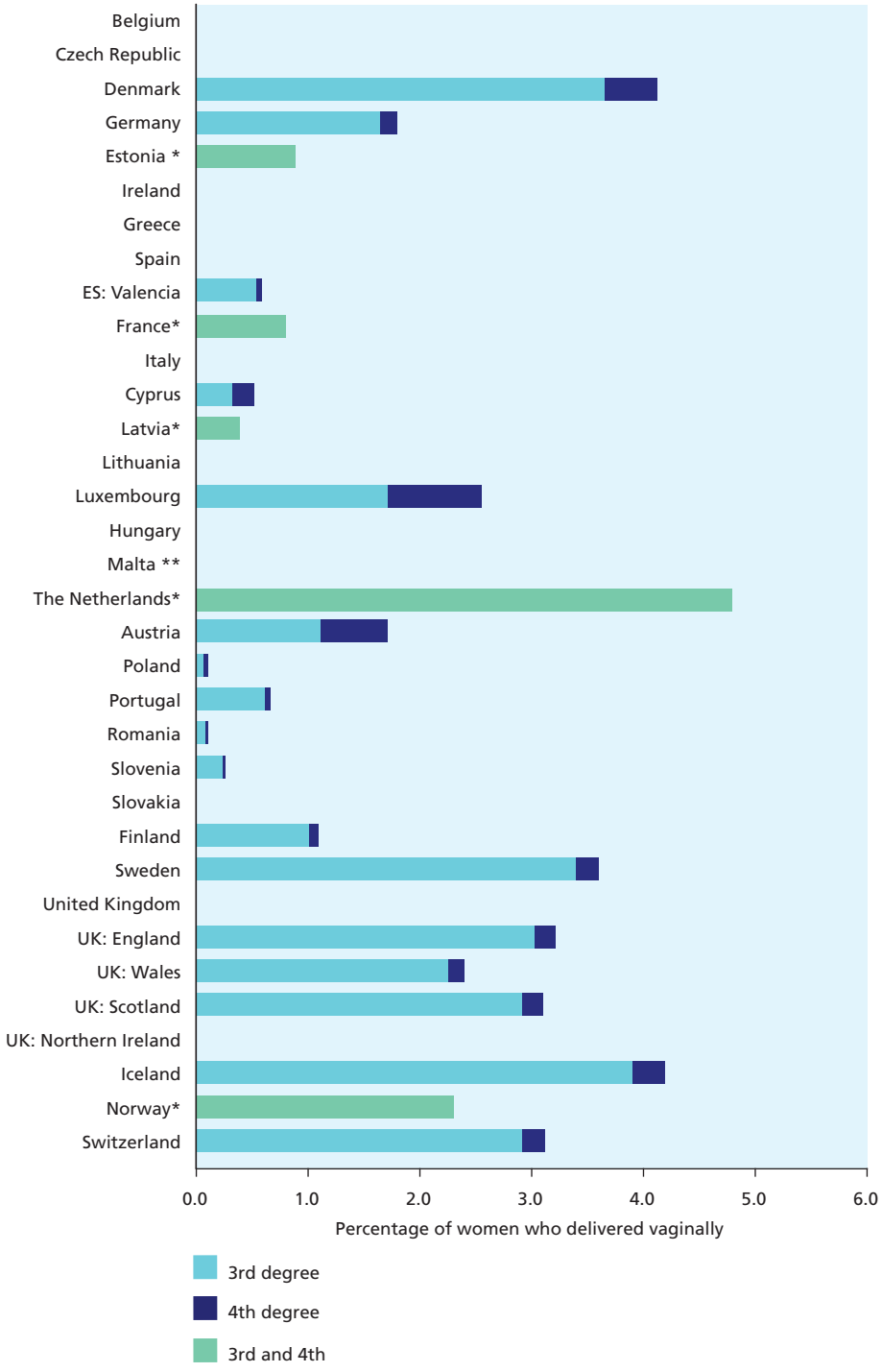
Figure 6.6 Incidence of third- and fourth-degree tears to the perineum in 2010



NOTE: * data for 3rd and 4th degree tears combined; ** only data for all tears