EUROPEAN PERINATAL HEALTH REPORT

Core indicators of the health and care of pregnant women and babies in Europe in 2015

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EURO PERISTAT

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ABBREVIATIONS AND ACRONYMS

ART	Assisted reproductive techniques
BMI	Body mass index
BW	Birth weight
CI	Confidence interval
EU	European Union
EUROCAT	European surveillance of congenital anomalies
GA	Gestational age
ICD	International classification of diseases
IQR	Interquartile range
MMR	Maternal mortality ratio
NA	Not available
RR	Risk ratio
TOP	Termination of pregnancy
WHO	World Health Organization

1 EXECUTIVE SUMMARY

EUROPEAN PERINATAL HEALTH IN EUROPE IN 2015: EXECUTIVE SUMMARY

1.1 A EUROPEAN VISION OF MATERNAL AND NEWBORN HEALTH

THE CHALLENGES

Maternal and newborn health are essential indicators of population health and wellbeing. Medical advances, universal access to healthcare, changes in population health, and increases in knowledge among childbearing women have been the drivers of decades-long decreases in newborn and maternal mortality in Europe. Yet despite this progress, there are major challenges to the goal of providing an optimal start in life for all children and families. The number of families touched by the loss of a child, either a stillbirth or an infant death, remains substantial — more than 40 000 families in Europe every year.[1] Second, while maternal deaths are increasingly rare, up to half are associated with substandard care. Moreover, it is estimated that between 1 and 3% of women experience severe morbidity during their delivery hospitalization, also often due to substandard care, although we lack good tools to measure this indicator.[2] Third, although the mortality associated with pregnancy complications such as preterm delivery and intrauterine growth restriction has decreased, prevention of these complications has been much less successful. Preterm birth rates have generally stayed stable in Europe or have risen in some countries.[3] Further, some major risk factors for maternal and infant complications, including older maternal age and obesity, are becoming more common and have the potential to stop or to reverse downward trends in mortality. Reducing these risk factors among childbearing women requires a holistic focus on population health before and during pregnancy. Finally, economic shocks in many countries have created difficult conditions for families that justify a special focus on protecting pregnant women and their newborns.

A LIFE COURSE APPROACH

As Europe adopts a life course approach to improving the health, well-being, and productivity of its citizens, the importance of maternal and newborn health takes on new weight. Good health during pregnancy and at birth extends beyond the perinatal period and is an essential building block for later health. Studies have related perinatal exposures and outcomes during pregnancy to increased susceptibility to many conditions, including asthma, allergies, obesity, hypertension, and other metabolic diseases. Mothers with particular complications during pregnancy, such as gestational diabetes or hypertension, are themselves more likely to develop these chronic problems later in life. The possibility of disrupting processes in the womb that can lead to poor health later in life or of intervening during pregnancy to promote women's later health provides a strong rationale for targeting the perinatal period. As poverty and social disadvantage remain key risk factors for a wide range of adverse perinatal outcomes, action in the perinatal period might also prevent the intergenerational transmission of poor health.

A EUROPEAN VISION

Exploring maternal and newborn health through a European lens offers a unique opportunity to obtain insight into these challenges and their possible solutions. Despite similar access to medical knowledge and universal insurance coverage for mothers and babies in most countries, the nations of Europe vary enormously in the care and support they provide during pregnancy and to newborn babies and their families.[4] By comparing maternal and child health and care across

Europe, we can benefit from the success stories and learn from each other through working collaboratively, especially in a long-standing European project such as Euro-Peristat. These data are of interest for many different groups, but most importantly, for pregnant women, their partners and their families, clinicians, researchers, and public health professionals.

1.2 EURO-PERISTAT: BETTER STATISTICS FOR BETTER HEALTH FOR MOTHERS AND THEIR BABIES

THE EURO-PERISTAT PROJECT

Euro-Peristat aims to monitor health in Europe with valid and reliable indicators. The Euro-Peristat project began in 1999 as part of the European Union Health Monitoring Programme and received funding in successive phases of its Public Health Programme. Euro-Peristat has been coordinated by INSERM (the French Institute of Health and Medical Research) since its inception. Currently, Euro-Peristat is part of a European Joint Action, InfAct (Information for Action), launched in March 2018. InfAct is working to provide a sustainable solution for European health information networks and better coordination of health information surveillance and data collection in Europe (https://www.inf-act.eu/). Data compilation and analysis for this report was co-funded by the BRIDGE Health project, which provided support for Euro-Peristat from May 2015 to October 2017. Most importantly, however, Euro-Peristat is made possible by the support of the participating institutions that provide routine statistical data to the Euro-Peristat coordination team. In addition, Euro-Peristat would not be able to validate or to report on these data without the invaluable input of our network of experts who contribute their time and expertise. Appendix A lists all contributors to this report. We also acknowledge the support of Inserm for coordination activities and of our partners in the Netherlands and the UK for contributing funds for the project meeting for this report.

THE EURO-PERISTAT NETWORK

Our network includes over 100 data providers and participating members in 31 European member states and other collaborating countries. In each country, one Scientific Committee member is responsible for the coordination of data collection, and other data providers and experts make up the collaborating team for each country. Since 2016 when Bulgaria and Croatia joined Euro-Peristat, the network has included all 28 current EU member states, as well as Iceland, Norway, and Switzerland.

THE EURO-PERISTAT INDICATORS

The Euro-Peristat indicator list includes 10 core indicators and 20 recommended indicators, grouped into 4 themes: (i) fetal, neonatal, and child health, (ii) maternal health, (iii) population characteristics and risk factors, and (iv) health services.[5] We define core indicators as those that are essential for monitoring perinatal health and recommended indicators as those considered desirable for a more complete comparison of perinatal health between countries. The Euro-Peristat indicators are compiled from population-based data aggregated at the national level from routine sources including civil registration systems, administrative or health registers, other statistical systems, or routine surveys.[6,7] However, if data are not available at the national level, population-based data can be submitted from regions or, as in the UK, from constituent countries.

REPORTING ON PERINATAL HEALTH IN 2015

This report includes data for all 10 Euro-Peristat core indicators and two of the 20 recommended indicators of maternal and newborn health in 2015. In the absence of funding for a full data collection exercise, the network decided to collect core indicators to be able to update essential basic information related to maternal and newborn health. Two recommended indicators – maternal smoking during pregnancy and prepregnancy body mass index – were also selected because their association with adverse perinatal health outcomes makes them of key relevance for preventive policies. We are hopeful that in the future, sustainable funding for perinatal data collection will make it possible to produce the full set of Euro-Peristat indicators related to the broader set of health and healthcare factors, as only these data enable us to address the high priority question of health inequalities on a European scale.

DATA COLLECTION

Euro-Peristat compiles its indicators from public national data systems. Data collection for this report began in January 2017. We asked for data on births in 2015, or for the most recent year if 2015 data were not yet available. We collected aggregated data with a standardised Excel-based instrument developed and adapted by the Netherlands Organisation for Applied Scientific Research, TNO Healthy Living in Leiden, the Netherlands. We also experimented with a new protocol for collecting data in multivariable aggregate tables, which are less time-consuming to output and which enable more flexible analyses. A STATA programme developed by Inserm allowed these to be converted into the aggregate tables. Overall, aggregated data files were constructed this way in 16 of 31 countries. All data were reviewed by the project coordination team based at Inserm in France, and queries were sent to individual Scientific Committee members and country data providers for review. Members of the Euro-Peristat network met in the Netherlands in April 2018 to review the preliminary tables. They used these to discuss observed geographical and temporal variations, with a particular focus on possible differences in indicator definitions and data collection. Scientific Committee members checked data for the indicators, reviewed and corrected the Euro-Peristat output tables, and contributed to writing and reviewing the written text before publication of this report.

COMPARING "LIKE WITH LIKE"

Euro-Peristat focuses on ensuring the development of high quality indicators that are feasible to collect and are comparable. The indicator set was originally developed through a DELPHI consensus process with national experts and has been updated before each new data collection exercise. Euro-Peristat standardises the population of births used to produce the indicators: we ask countries to provide numbers of all births at 22 or more weeks of gestation or weighing 500 grams or more if gestational age is missing or not recorded. Next, we compile data in subgroups to allow us to refine our indicators. For the mortality indicators, we derive rates from data from which births at 22 and 23 weeks of gestation have been removed, because it is well known that these births are not recorded in the same ways in all statistical systems.[8] Consequently, because almost all of these extremely preterm babies at 22 and 23 weeks die, they have an extensive impact on comparisons of mortality statistics. For stillbirths we derive rates from data from which births before 28 weeks have been removed, as recommended by the World Health Organization to increase comparability. However, as Euro-Peristat argued in an article in the Lancet in 2018,[9] a 24-week cutoff can be used in most European countries, so that stillbirths can be compared at earlier gestational ages. We hope in the future to report all deaths from 22 weeks onwards to

acknowledge the burden of loss to a greater number of families and identify issues relating to variation in provision of care at these earlier gestations. We also collect data by other clinically relevant subgroups, such as multiplicity and birth weight. These subgroup analyses increase our ability to compare "like with like" and provide additional information about health and care. They are also very important for comparing women's risks of caesarean birth.

1.3 RESULTS: THE BIG PICTURE

EUROPE CONTINUES TO PROVIDE STRONG MODELS OF MATERNAL AND NEWBORN HEALTH

A first overarching message is that in 2015 rates of stillbirth and neonatal, infant, and maternal death were lower for babies and women in Europe than in other parts of the world, including other high-income countries outside Europe. Reassuringly, stillbirth and neonatal mortality rates continue to decline, albeit unevenly and more slowly than in previous periods. Preterm birth and low birthweight rates, while not declining, have stayed stable overall, as observed in previous Euro-Peristat reports. Rates of caesarean birth in some Euro-Peristat countries are among the lowest in high-income and middle-income countries, in particular, Iceland, Finland, Norway, and the Netherlands. Most countries have declining or stable caesarean birth rates, although some, including Poland, Romania, Bulgaria, and Cyprus, report worrying increases. These positive achievements overall come despite widespread changes in some risk factors that predispose women to adverse pregnancy outcomes, such as older age at childbirth and obesity. In this respect, Europe offers strong models for providing high quality care to women and newborns.

BUT WIDE DIFFERENCES PERSIST BETWEEN COUNTRIES

A second message is the continuing striking variation between countries in Europe. Many indicators vary by a factor of at least two between countries with the highest and lowest rates. This variation is also evident in the changes in indicator values between the data for 2015 included in this report and our previous report on data from 2010. The comparisons we have presented show both significant decreases and increases. The successes in the countries with the best outcomes can be used to set goals for other countries. Moreover, this variation challenges clinicians, researchers, and policy makers to identify the explanations for changing outcomes, which may reflect population as well as healthcare factors. It is also important to consider whether there have been changes in data reporting. From a health policy perspective, the comparisons of indicators in 2010 and 2015 and the possibility that lower rates of some indicators might reflect policy decisions are highly interesting. For example, the Netherlands and the UK implemented audits on stillbirths and report a greater reduction in stillbirth rates between 2010 and 2015 than other countries. Policies to reduce the numbers of multiple pregnancies through assisted reproductive technology (ART) in the Czech Republic were accompanied by decreases in both multiple pregnancy and preterm birth rates. More investigation of these case studies is needed to understand these relationships and could yield important examples of successful policy initiatives that could be adopted more widely.

1.4 RESULTS: A SUMMARY OF KEY FINDINGS

THE INCREASE SINCE 2010 IN MANY RISK FACTORS FOR CHILDBEARING WOMEN PRESENTS A COMMON CHALLENGE

The core and recommended indicators in this report describe characteristics of the childbearing population that are related to risks of mortality, morbidity, and obstetric interventions. These are multiple birth, maternal age, parity, smoking, and maternal prepregnancy body mass index. Population characteristics may explain differences between countries as well as changes over time.

- Women with multiple pregnancies face higher risks of preterm birth and perinatal mortality and morbidity. In Europe, the median multiple pregnancy rate is 16.7 per 1000 women delivering a live or stillbirth. Countries with high multiple birth rates — over 19 per 1000 — are Ireland, Germany, Slovenia, Spain, and Cyprus, whereas low multiple birth rates — under 14 — are found in Romania, Slovakia, Poland, Greece, Finland, and Lithuania.
- The median percentage of women having babies at 35 years of age or older was 20.8%; percentages exceeded 29% in Portugal, Greece, Ireland, Italy, and Spain and were less than 15% in Bulgaria, Romania, and Poland.
- Teenage pregnancy is increasingly uncommon in Europe; in 21 countries, fewer than 3% of women were under 20 years of age at the birth of their child. This percentage exceeded 6% in several countries, however: Slovakia, Hungary, Romania, and Bulgaria.
- While the age distributions of childbearing women differ, there is a common trend toward later age at childbirth. Overall the percentage of mothers aged 35 years or older increased by 16%, with the biggest increases in Cyprus, Hungary, the Czech Republic, and Portugal.
- Maternal obesity is also increasing, although our vision is very partial as only 12 of the 31 countries participating in Euro-Peristat could provide this information. The median prevalence of obesity before pregnancy, as defined by a maternal body mass index of 30 or greater, was 13.2% in these countries, ranging from 7.8 to 25.6%. In 7 of the 9 countries that also had data for 2010, percentages were higher in 2015.
- Smoking in pregnancy is a subject on which there is good news to report. Overall, the percentage of women smoking during pregnancy in 2015 was 13% lower than in 2010. However, progress is possible in many countries. In a quarter of the 19 countries able to report data on smoking during pregnancy, more than 12.5% of women smoked, with percentages highest in Valencia in Spain (18.3), Wales (17.3), France (16.3), and Northern Ireland (14.3). In contrast, in Norway, Sweden, and Lithuania, fewer than 5% of women smoked during pregnancy.

EUROPEAN DISPARITIES IN MODE OF DELIVERY HAVE WIDENED

- In Europe, the median caesarean section rate is 27.0% and one quarter of countries have rates below 21%. Iceland, Finland, Norway, and the Netherlands have the lowest rates, under 18%, while Italy, Hungary, Poland, Bulgaria, Romania, and Cyprus had rates over 35%.
- Overall, caesarean birth rates were 4% higher in 2015 than in 2010, but this represents an average including much greater increases in countries such as Romania, up by 27% (from 36.9% to 46.9%), Poland 24% (from 34.0% to 42.2%), Hungary 21% (from 32.3% to 39%), and Scotland 17% (from 27.8% to 32.5%).
- In contrast, caesarean section rates decreased in Lithuania, Latvia, Portugal, Estonia, Italy, and Norway.

- These differences between countries are also observed in subgroup analyses. For babies in a breech presentation, the median caesarean rate was 89%, with a range from 64.3% to 100%. In 4 countries, Norway, Latvia, Finland, and France, 25% or more of breech babies babies were born vaginally.
- Ten countries have no data about risk subgroups; unfortunately, many of these countries are those with high rates of caesarean births, where evaluating current practices is particularly important.
- Instrumental birth rates varied widely. The median was 7.2%, ranging from below 3.5% in a quarter of countries to over 10.9% in another quarter. Rates under 2.5% were observed in Romania, Croatia, Lithuania, Slovakia, and Latvia and over 12% in France, Scotland and England in the UK, Spain, and Ireland.

POOR QUALITY STATISTICS CONTINUE TO HAMPER EUROPEAN SURVEILLANCE OF MATERNAL DEATHS

- Most countries rely on routine cause of death statistics to measure maternal deaths, despite well-known under-reporting. Because of this, and very low numbers, no firm conclusions can be drawn for most countries about whether their maternal mortality ratios (MMRs) are higher or lower than in other European countries or whether there have been changes over time. This is a major limitation to benchmarking across countries. All European countries should be able to provide reliable statistics on maternal deaths, as in the countries that have enhanced reporting systems.

- Maternal mortality appears to have declined in countries that carefully count and analyse maternal deaths. MMRs computed with data from enhanced systems decreased in the most recent five-year period compared to data reported in our previous report, but only 7 countries had data from these systems. Since many enhanced systems are accompanied by audits, these systems may contribute to improving care for pregnant women and therefore the results from these countries may not apply more generally.

OVERALL, STILLBIRTH AND NEONATAL MORTALITY RATES DECLINED, BUT WITH HIGH HETEROGENEITY

- The median stillbirth rate at 28 weeks of gestation and over was 2.7 per 1000 births. Rates below 2.3 per 1000 were reported in Cyprus, Iceland, Denmark, Finland, and the Netherlands, and rates of 3.5 per 1000 or more in Slovakia, Romania, Hungary, and Bulgaria. When stillbirths between 24 and 27 weeks of gestation were included, the median rate was 3.4, but the ranking of countries remained similar.
- Overall, stillbirth rates in 2015 were 5% lower than in 2010, but this reflects an average between large declines in the Netherlands, Scotland, and Poland and stable rates in other countries.
- For neonatal mortality rates at 22 weeks and over, the European median was 2.2 per 1000 live births. Countries with rates of 1.5 per 1000 or lower were Slovenia, Iceland, Finland, Norway, the Czech Republic, Estonia, and Sweden, while Northern Ireland, Malta, Romania, and Bulgaria had rates above 3.5 per 1000. Some of this variability in neonatal mortality rates is related to differences in policies governing terminations of pregnancy for fetal anomalies.

- After excluding births at 22 and 23 weeks of gestational age, accounting for about 19% of all neonatal deaths, the median was lower, 1.7 per 1000, but rankings were similar. Low rates were less than 1.2 per 1000 while higher rates exceeded 3.0 per 1000. However, 7 countries were unable to provide the information needed for this comparison.
- Overall, neonatal mortality declined, and these declines were more marked when babies born at 22 and 23 weeks were excluded. In some countries however, neonatal mortality rates were higher in 2015, significantly so in Portugal.
- For infant mortality, the median was 3.1 per 1000 with lower mortality countries reporting rates of 2 and lower, and higher mortality countries with rates of 5 per 1000 or more. Ten countries were unable to provide data to calculate mortality rates without babies born at 22 or 23 weeks, who were estimated to account for 16% of all deaths.

PRETERM BIRTH AND LOW BIRTH WEIGHT REMAIN STABLE OVERALL WITH STRONG GEOGRAPHICAL PATTERNS

- Babies with a low birth weight (< 2500 grams) accounted for less than 4.5% of all births in Iceland, Sweden, Finland, and Estonia and more than 8.0% in Spain, Hungary, Portugal, Greece, Bulgaria, and Cyprus.
- When comparing 2015 to 2010, there were significant decreases in some counties (Norway, Greece, and Austria) and increases in others (Iceland, France, Ireland, Northern Ireland, and Portugal).
- Preterm birth rates ranged from less than 6% in Finland, Latvia, Estonia, Sweden, and Lithuania to more than 8.0% in Belgium, Scotland, Romania, Germany, Hungary, Greece, and Cyprus, with a European median of 7.3%.
- Changes since 2010 were highly heterogeneous, with significant declines in 7 countries, including the Netherlands, Austria, and the Czech Republic and significant increases in 8 countries.

1.5 THE NEED FOR CONTINUOUS AND MORE COMPLETE MONITORING

This European Perinatal Health report illustrates the feasibility and the importance of comparable data on maternal and newborn health across Europe. It also highlights significant challenges, both in data quality and availability. These problems have been highlighted for each indicator in the text.

The set of Euro-Peristat indicators should represent minimum standards for national reporting. Data availability overall is good for the core indicators, but tabulations by subgroups are not available for all indicators. Many countries were unable to provide data on maternal smoking or prepregnancy body mass index, although these are needed to evaluate policies to improve population health.

In addition to the challenges facing each country in improving their data quality and availability, this report suffers from a lack of continuous time series data. We cannot accurately describe trends in the indicators without annual data, especially in countries with small numbers of births each year; consequently, we observe substantial year to year variation in indicator values. While combining data from 31 countries to undertake “like with like” comparisons requires substantial effort, especially with regard to data cleaning and checking, this report shows that it is possible. A goal for current health information initiatives should be to create a sustainable structure and a funding stream to support collection, data cleaning and validation, and analysis of data from routine statistical systems in European countries on an annual basis. This would provide up-to-date knowledge about key indicators of maternal and newborn health to pregnant women and their families, clinicians, and policy makers and enable better monitoring of trends over time.

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2

THE EUROPEAN PERINATAL HEALTH REPORT ON CORE INDICATORS IN 2015: INTRODUCTION AND METHODS

2. THE EUROPEAN PERINATAL HEALTH REPORT ON CORE INDICATORS IN 2015: INTRODUCTION AND METHODS

This report presents the Euro-Peristat perinatal health indicators in 2015 from 31 European countries, including the 28 European Union member states and Iceland, Norway, and Switzerland. The indicators comprise the full set of 10 core indicators as well as two recommended indicators in the Euro-Peristat indicator set.[1] Other Euro-Peristat recommended indicators will be published at a later date.

2.1 SURVEILLANCE OF PERINATAL HEALTH IN EUROPE

MATERNAL AND NEWBORN HEALTH IN EUROPE IS A PRIORITY

Promoting healthy pregnancy and safe childbirth is a goal of all European countries. Despite continuing and significant reductions in maternal and perinatal mortality over recent decades,[1] mothers and their babies are still at risk during the perinatal period, defined as pregnancy, delivery, and the postpartum period. Over 5 million babies are born in European Union member states every year; approximately 23 000 are stillborn, 22 000 die before their first birthday, and 8 per 1000 suffer from severe sensory or cognitive impairments.[2,3] The principal pregnancy complications leading to perinatal mortality and morbidity are preterm birth, fetal growth restriction, and congenital anomalies. The increased or at best stable percentage of children born preterm in many countries[4,5] reflects limited achievements in prevention, compared with the medical advances that have reduced mortality among infants born preterm or with other perinatal complications. Maternal deaths are increasingly rare, but up to half are associated with substandard care. Although severe maternal morbidity is measured inadequately and inconsistently throughout most of Europe, it is estimated that between 1 and 3% of women receive a life-threatening diagnosis or require a life-saving procedure during their delivery hospitalisation.[6,7]

Poor maternal and newborn health have long-lasting consequences. Research on the early origins of adult diseases underscores the vital importance of perinatal events and underpins calls for public health interventions targeting the first 1000 days of life.[8,9] For instance, preterm birth and fetal growth restriction are associated with the development of chronic illnesses such as hypertension and metabolic disease in later life.[10] Risk factors for poor perinatal outcome, such as smoking and obesity, continue to exert an effect through the child's increased susceptibility to asthma, obesity, and developmental delays. The social context and consequences of these effects must also be considered, as the burden of poor health falls disproportionately on socially disadvantaged women and babies.[11,12] Adverse perinatal health outcomes perpetuate health and social inequalities within and between countries.

PERINATAL HEALTH SURVEILLANCE AT A EUROPEAN LEVEL ADDS VALUE TO NATIONAL INITIATIVES

High quality health information is needed to support decision-making about health practices and policies for pregnant women and newborns. Two principal reasons strongly justify the development of a European perinatal health information system from a public health perspective.

First, European countries face similar economic, demographic, and medical challenges. Many common economic and demographic pressures affect women and babies and require surveillance.

Because many countries are experiencing very low fertility rates, investments in young families and children constitute a strategic priority for them. The increase in almost all countries of risk factors for poor perinatal health, such as older age at childbirth and maternal obesity, requires healthcare services to adapt to the evolving needs of mothers and children. Similarly, questions about the optimal use of new health technologies, such as prenatal genetic screening or subfertility procedures, are of concern everywhere. These questions touch on a wide range of societal concerns, including quality of care, the expectations and satisfaction of pregnant women and their families, ethics decisions, and healthcare costs.

Second, European countries can benefit from pooling their experiences to improve health care delivery and public policy. Understanding how neighbouring countries manage these common risks and challenges adds to the range of solutions available for national policy makers. Great diversity in cultural, social, and organisational approaches to childbirth and infant care exists within Europe and raises important questions about the best use of healthcare interventions and the quality of care. Data on medical practices and health are essential benchmarks for evaluating these diverse models and identifying possible gains in efficiency and cost-effectiveness.
The benefits of having statistics on maternal and child health are obvious, and most individual countries have data that are used for surveillance on the national level. However, many key indicators of maternal and child health and health care are currently not available in international databases (Eurostat, OECD, or WHO) or are not sufficiently standardised to permit valid comparisons.[13]

THE EURO-PERISTAT PROJECT: SURVEILLANCE AND ANALYSIS OF PERINATAL HEALTH IN EUROPE

The Euro-Peristat project's goal is to develop valid and reliable indicators that can be used for monitoring and evaluating perinatal health in Europe. The project began in 1999 as part of the Health Monitoring Programme and has enlisted the assistance of perinatal health professionals (clinicians, epidemiologists, and statisticians) from European Union member states and Iceland, Norway, and Switzerland as well as other networks, notably SCPE (a network of European cerebral palsy registries), ROAM (Reproductive Outcomes and Migration Collaboration), and EUROCAT (a network of European congenital anomaly registries), to develop its recommended indicator list.

It thus aims to (1) assess maternal and infant mortality and morbidity associated with pregnancy, delivery, and the postpartum period; (2) describe the changes in risk factors for perinatal health outcomes in the population of childbearing women, including demographic, socio-economic and behavioural characteristics, and (3) monitor the use and consequences of medical interventions in the care of women and babies during these same three periods.

In its first phase, the Euro-Peristat Project developed a set of indicators with members from the then 15 member states of the European Union.[14] This indicator set was developed by a procedure that began with an extensive review of existing perinatal health indicators and was used as the basis of a DELPHI consensus process, a formalised method in which selected experts respond to a successive series of questionnaires with the aim of achieving a consensus on key principles or proposals. Our first panel of experts in 2002 was composed of clinicians, epidemiologists, and statisticians. We also invited the SCPE network to assist with the indicator on cerebral palsy. A second DELPHI process was also conducted in 2002, with a panel of midwives to ensure that their perspectives on perinatal health were represented. A third DELPHI process was conducted in 2006 with a panel of 2 participants (clinicians, epidemiologists, and statisticians) from each of the 10 newest member states of the European Union. Minor updates to this list were undertaken again before collection of 2010 and 2015 data. The changes to the indicator list reflect the emergence of new priorities as well as our experience testing the feasibility and utility of collecting and presenting the indicators.

This feasibility testing has simultaneously enabled Euro-Peristat to use these indicators to evaluate perinatal health in Europe. The first publication was a special issue of the *European Journal of Obstetrics, Gynecology, and Reproductive Biology*. We then produced two European Perinatal Health Reports (in 2008 based on 2004 data and in 2013 based on 2010 data).[2,3] Our group and others using our open access databases have published more than 60 scientific articles based on Euro-Peristat data. These publications focus on methods – how to create better, more comparable indicators – and on evaluating health and health care across Europe. A list of the Euro-Peristat publications is available on our website (http://www.europeristat.com/reports/scientific-publications.html).

The Euro-Peristat network includes one Scientific Committee representative per country and other data providers and experts who make up the team for each country (see http://www.europeristat.com/our-network/country-teams.html and Appendix A for the list of contributors). Because Bulgaria and Croatia joined the network in 2016, it is now able to provide complete coverage of all European Union members.

Currently Euro-Peristat is funded as part of a European Joint Action, InfAct, on health information. InfAct (Information for Action), launched in March 2018, includes 40 partners in 28 EU and associated countries. It aims to provide a sustainable solution for health information networks in Europe and better coordination of health information surveillance strategies and data collection in Europe (https://www.inf-act.eu/). Data compilation and analysis for this report was funded by the BRIDGE Health project, which provided support for Euro-Peristat from May 2015 to October 2017. This funding did not cover collection of the full set of Euro-Peristat indicators, which is why this report focuses on the core indicators and two recommended indicators.

Euro-Peristat is also supported by participating institutions that provide routine statistical data to the Euro-Peristat coordination team and our network of experts who contribute their time and expertise. Appendix A lists all contributors to this report.

EURO-PERISTAT INDICATORS

The current Euro-Peristat indicator list includes 10 core indicators and 20 recommended indicators and are grouped into 4 themes, as shown in the table below: (i) fetal, neonatal, and child health, (ii) maternal health, (iii) population characteristics and risk factors, and (iv) health services.
We defined core indicators as those that are essential for monitoring perinatal health and recommended indicators as those considered desirable for a more complete picture of perinatal health across the member states. We also identified several indicators for further development; they are defined as those that represent important aspects of perinatal health but require further work before they can be implemented.

Table 2.1 Euro-Peristat's 10 core and 20 recommended indicators.

FETAL, NEONATAL, AND CHILD HEALTH	
C1:	Fetal mortality rate by gestational age, birth weight, and plurality
C2:	Neonatal mortality rate by gestational age, birth weight, and plurality
C3:	Infant mortality rate by gestational age, birth weight, and plurality
C4:	Distribution of birth weight by vital status, gestational age, and plurality
C5:	Distribution of gestational age by vital status and plurality
R1:	Prevalence of selected congenital anomalies
R2:	Distribution of 5-minute Apgar scores
R3:	Fetal and neonatal deaths due to congenital anomalies
R4:	Prevalence of cerebral palsy
MATERNAL HEALTH	
C6:	Maternal mortality ratio
R5:	Maternal mortality by cause of death
R6:	Incidence of severe maternal morbidity
R7:	Incidence of tears to the perineum
POPULATION CHARACTERISTICS/RISK FACTORS	
C7:	Multiple birth rate by number of fetuses
C8:	Distribution of maternal age
C9:	Distribution of parity
R8:	Percentage of women who smoked during pregnancy
R9:	Distribution of mothers' educational level
R10:	Distribution of parents' occupational classification
R11:	Distribution of mothers' country of birth
R12:	Distribution of mothers' prepregnancy body mass index
HEALTHCARE SERVICES	
C10:	Mode of delivery by parity, plurality, presentation, previous caesarean section, and gestational age
R13:	Percentage of all pregnancies following treatment for subfertility
R14:	Distribution of timing of first antenatal visit
R15:	Distribution of births by mode of onset of labour
R16:	Distribution of place of birth by volume of deliveries
R17:	Percentage of very preterm babies delivered in units without a neonatal intensive care unit
R18:	Episiotomy rate
R19:	Births without obstetric intervention
R20:	Percentage of infants breast fed at birth

2.2 DATA COLLECTION AND AVAILABILITY

The Euro-Peristat indicators are compiled from population-based data at the national level from routine sources (ie, administrative or health registers, statistical systems or routine surveys). However, if data at the national level are not available, countries can submit population-based data from regions or from constituent countries, as the UK does. Scientific Committee representatives are responsible for overseeing data collection for their country in collaboration with their country team members.

Data collection began in January 2017. We asked for data on births in 2015 or the most recent year if 2015 data were not yet available. Euro-Peristat collects aggregated data by using a standardised Excel-based instrument developed and adapted by the Netherlands Organisation for Applied Scientific Research, TNO Healthy Living in Leiden, the Netherlands. In this data collection exercise, some countries tested a program to automatically generate the aggregated data sheets from disaggregated multivariate tables, an approach that Euro-Peristat would like to develop in the future to improve quality and standardisation. Information on data sources and data quality were also collected. Data were reviewed by the project coordination team based at Inserm in France, and queries were then sent to individual country teams (ie, Scientific Committee members and data providers) for review.

Members of the Euro-Peristat network met in the Netherlands in April of 2018 to review the preliminary results and discuss explanations for observed geographical and temporal variations, with a particular focus on possible differences in indicator definitions. Scientific Committee members checked data for the indicators, endorsed the Euro-Peristat output tables, and contributed to writing and reviewing the written text before publication of this report.

DATA SOURCES

Countries used multiple sources including civil registers based on birth and death certificates, medical birth registers, hospital discharge systems, and survey data. Most countries used at least 2 separate data sources; the number of sources varied between 1 (Greece, Norway, and Sweden, for instance) and 15 (for the UK and its four constituent countries). However, some databases centralise data from multiple sources; for instance, Norway's medical birth register is routinely linked with civil registration data, the ART registry, and abortion data (for terminations of pregnancy) and would therefore be considered a single source. Table 2.2 summarises countries' main sources of data for perinatal health reporting. If several data sources were available for a given indicator, Scientific Committee members were asked to select the best source based on quality and comprehensiveness. For each indicator, the data source is identified in the summary tables in Appendix B. More details on each of these data sources can be found in Appendix C.

Civil registration systems collect information related to perinatal health and vital statistics related to all births and deaths. Some civil registration systems also record background characteristics, such as mother's age, parity, and plurality, or babies' birth weights, but most countries record only a limited number of variables related to perinatal health. Civil registration is required by law and is very complete for citizens and permanent residents. Most countries also register information about births to women who are non-residents. Many countries derive numbers of live births, stillbirths, infant deaths, and maternal deaths from civil registration. This includes a compulsory medical certification of causes of death in all countries, although some process this separately.

While all countries have civil registration, the majority of Euro-Peristat core indicators are derived from medical birth registers. These registers contain more specific information about maternal characteristics and about diagnoses, care, and interventions during the perinatal period for mothers and children. Data provision is mandatory in most countries, but even registers that are voluntary (eg, Luxembourg, Malta, and the Netherlands) have good coverage. Midwives, nurses, or doctors record information for the medical birth registers in maternity and neonatal units, either on a data collection form or on electronic patient data systems from which they are subsequently abstracted.

Civil registration and medical birth register data are the most comprehensive at the population-level; coverage is usually close to 100%. Appendix C reports the percentage of coverage estimates for each of the data sources used in this report.

Besides civil registration and medical birth registers, other data sources include hospital discharge systems that record information about hospital births. These healthcare system databases include information about all care provided in the relevant area, including births to women without permanent residence status (immigrants, refugees, and asylum seekers) as well as visitors and women from other countries seeking health care. This can cause discrepancies in the total number of births when compared with civil registration data, which may have different inclusion rules.

Hospital discharge systems record data about births and interventions during the hospital stay (ie, caesarean or instrumental deliveries, clinical diagnoses during pregnancy and at birth, hospital care after delivery, interventions and clinical diagnoses in mothers and babies until discharge). However, these systems usually do not cover use of primary healthcare services or home or other out-of-hospital births. Use of these databases presents other methodological concerns. For instance, their use to estimate incidence or prevalence data may result in overestimates if the systems do not use a unique identifier to record multiple admissions of the same person.[15] This is of particular concern for newborns or mothers who may be admitted to intensive care in another hospital. For some countries, such as Portugal, data collection is mandatory only for public hospitals. If the diagnoses or interventions in the hospital discharge systems are used for financial purposes (ie, health insurance funds), there may be bias related to the tendency to include only or especially care with more complicated diagnoses or only the diagnoses or procedures that provide funding for the hospitals.

To collect more information about maternal and infant mortality, some countries organise confidential enquiries or audits to ascertain all cases and examine whether substandard care or other avoidable factors could have contributed to the death.[16] Table 2.2 specifies the countries performing such audits. Finally, routine surveys are another source of information on births, as in France where a national survey is conducted about every five years in all maternity units during one week of the year. Further analysis of the data sources used to report on perinatal health in participating countries can be found in publications by the Euro-Peristat group.[13,15,17]

LINKING DATA SOURCES

Euro-Peristat has studied methods for improving data for perinatal health surveillance. Data linkage of patient records across population-based registers has been identified as one way to improve the range and quality of data available about each birth. Countries that link data routinely are able to produce more of the Euro-Peristat core and recommended indicators.[18]

For this data collection exercise, 20 of the 31 participating countries reported linking data sources. Some countries perform these linkages routinely by linking birth and death certificates or medical birth register data to civil registration data to increase the completeness of data on deaths after the perinatal period. Other types of linkages, for example to education or specific disease registers (ie, cancer, ART, and congenital anomalies) can also enrich the information available on outcomes during childhood or later on in life. In a few countries, linkages can only be done for ad hoc statistical or research purposes. The availability of unique identification numbers facilitates linkage between data sources, but other techniques exist. They rely on probabilistic matching of information, such as the mother's name, date of birth, and address, as well as information about the newborn, including, for example, gestational age and birth weight.[18]

Structural differences in data quality and privacy frameworks across Europe can hamper countries' capacities to link data systems. Nonetheless, Euro-Peristat recommends broader adoption of data linkage to increase the breadth and quality of information available for perinatal health research and surveillance.[13,15,17,18]

INCLUSION CRITERIA FOR BIRTHS AND DEATHS

Euro-Peristat requested data for all stillbirths and live births from 22 weeks of completed gestation or, if gestational age was not available, a birth weight cutoff of 500 grams. Because most countries do not have legal registration limits for live births, defined as any birth with signs of life, they are able to provide data based on Euro-Peristat's inclusion criteria. For fetal deaths, most countries were able to provide data for deaths at or after a gestational age limit of 22 weeks, but some countries use other criteria, such as birth weight (ie, 500 grams) or higher gestational age limits (eg, 24 weeks). If countries cannot provide data according to the Euro-Peristat inclusion criteria, they are asked to provide data by using their national criteria. This can lead to differences in the lower inclusion limits for births and deaths for data provided to Euro-Peristat. In some countries, legal limits for registration are different from those used to provide data for Euro-Peristat because the data do not come from civil registration data. The Netherlands and Italy, for example, were able to provide data for stillbirths below the lower limit for legal registration, ie, over 22 weeks of gestational age in both countries, because they used data registers that include stillbirths at lower gestations. The descriptions of the fetal (see C1) and neonatal (see C2) mortality indicators include the exact inclusion criteria for participating countries.

Because of differences in legislation and practices for registering births and deaths, it is essential to report on mortality statistics that use common gestational age limits, to make these rates more comparable between countries. Based on results of research using data collected in previous years,[19, 20] the Euro-Peristat network excludes deaths at very early gestational ages, which are the most likely to be affected by registration differences: 22–23 weeks for neonatal mortality and 22–27 weeks for fetal mortality.[20] We focus on gestational age thresholds because most countries base inclusion criteria for stillbirths on gestational age and also because we found that using a birth weight of 1000 grams versus a gestational age cutoff of 28 weeks underestimated the burden of third trimester stillbirths.[19] In this report, we also include comparisons of fetal mortality rates between 24 and 27 weeks of gestation, to provide more complete reporting of stillbirths, as explained in the section on fetal mortality (see C1).

For this report, we requested data about notification of late terminations of pregnancy. Some of the variation in fetal mortality between European countries is due to differences in reporting

of terminations at 22 weeks and later.[21] Some countries register these terminations as stillbirths, whereas elsewhere terminations are recorded in a separate system or not reported at all. This information is presented in the section on fetal mortality, and rates are provided with and without terminations to allow readers to take these differences into consideration.

While differences in the recording of births and deaths at the limits of viability can have a large impact on mortality rates, they have less impact on other perinatal health indicators because these births and deaths account for a very small proportion of all births.[22] On average, births below 24 weeks of gestation make up less than 0.1% of total births.[22]

COMPARING PERINATAL HEALTH INDICATORS BETWEEN COUNTRIES

In defining our indicators, the Euro-Peristat network aims to reduce variation in indicators attributable to differences in definitions or recording practices from country to country. This has been accomplished by selecting definitions most likely to be feasible and by carefully designing the data collection instrument. Nonetheless, not all countries can produce data according to the recommended definitions. For example, the requested denominators are not always available – such as childbearing women rather than births, or total births rather than live births. Some countries were able to provide information for all births, but not separately for singletons and multiples. Data for the requested time frames were also not always available. For instance, we requested mortality information for 2011-2015, but some countries were only able to provide data for 2010-2014 or 2008-2012. These differences are noted in the relevant tables and figures.

Another issue that can affect the comparability of indicators is the management of missing data. Euro-Peristat collects data along with the number of "unknown" or "missing" cases. These data are not always available, however. If check-box answers are interpreted as a positive answer (yes), missing data tend to be automatically, but erroneously interpreted as a negative answer (no). The data tables in Appendix B report the number of missing cases for each indicator, when this information is available, in the column labelled "not stated". In our data exercise, unless noted otherwise, we calculated rates and percentages by excluding cases with missing data.

Finally, account must be taken of random variation in making comparisons. The largest member states – France, Germany, Italy, and the UK – each have more than half a million births per year. The annual number of births is smallest in Malta and Iceland (around 4500), Luxembourg (around 6500), and Cyprus (around 9500). Estonia and Slovenia have 14 000-20 000 births per year. For smaller countries, the data for a single year may not contain sufficient numbers of events to construct reliable rates to measure less frequent maternal or child outcomes. For maternal mortality, which is extremely rare, rates are measured using data for five years, but this does not solve the problem in smaller countries. The Euro-Peristat group has studied the best ways to present data to call attention to the variation in indicators due to small population size.[23] In this report, we present data on changes in the Euro-Peristat indicators between 2010 and 2015 with relative risk ratios and their 95% confidence intervals. We have also included the number of births in the first graph of each section so that the reader can interpret the data with the number of annual births in mind.

Because of the importance of these methodological issues, for each indicator in the report, we detail the specific questions that should be kept in mind when interpreting variations. We urge our readers to look closely at these sections.

DATA AVAILABILITY

All countries provided data for 2015, with the exception of Bulgaria, Poland, Sweden, and Switzerland whose data refer to births in 2014. Figure 2.1 presents the percentage of countries that provided each of the Euro-Peristat indicators for this report, overall and by subgroup. Partial availability refers to situations where some data are available but with significant differences from the Euro-Peristat definition or with coverage that is not nationwide. Coverage that is complete, but based on several subnational systems that have not been merged to provide a national value (as for some indicators in the UK), is considered fully available. Countries using different years were similarly considered to have full availability.

In general, availability for the core indicators was good – as would be expected as these are basic population health indicators. However, not all countries can provide these indicators by key subgroups, such as gestational age, birth weight, or plurality. This issue is most acute for infant deaths. Linkage of birth and death certificates should make this possible in most countries, and Euro-Peristat urges all countries to achieve full availability on this core indicator set.

Data for the two recommended indicators – on smoking (R8) and prepregnancy body mass index (R12) – came essentially from medical birth registers and from a perinatal survey in France. Data availability for these two indicators in the participating countries is not as good as that for the core indicators. Smoking and prepregnancy body mass index are known risk factors for adverse perinatal health outcomes and provide useful information for interpreting the baseline prevalence and risk of other indicators (ie, low birth weight, preterm birth).

COMPARISONS WITH 2010

There have been some positive changes in data availability since our data collection in 2010. Cyprus now has national data as opposed to survey data, and Greece is lowering its registration criteria for stillbirths to 22 weeks of gestation. France has also put into place a new system for monitoring stillbirths and the gestational age and birthweight distribution from its hospital discharge data since 2012; in our 2010 report, national data came from the French Perinatal Survey, which is a nationally representative sample of births. In Belgium, data are now available nationally for all births, whereas in our previous reports, data were reported separately by region.

For this report, several countries provided new or updated data from 2010 which allowed us to compare their data for these two years. For instance, Belgium provided national level data for 2010 and Greece was able to provide data from 2010 which were not included in our last report. Spain provided data on caesarean section rates in 2010, as their new data included private hospitals, whereas reported data in 2010 only covered the public hospitals. In comparisons with 2010, we aimed to maintain the same data sources. For instance, in France, because national data were not available in 2010 for stillbirths, preterm births, or low birth weight, comparisons with 2010 use data from the most recent French Perinatal Survey.

2.3 PRESENTATION OF DATA IN THE REPORT

In this report, the figures and tables order countries alphabetically according to each country's official name, in accordance with the convention used for European Union publications.
This ordering was used in the first Euro-Peristat report and continued in subsequent reports. Therefore, figures and tables can be compared between reports as well with other European data tables, such as those produced by Eurostat.

While sorting indicators – from lowest to highest, for instance – makes graphs easier to read, presenting data in this way can lead to erroneous interpretations. Ordering countries creates a performance ranking that implies that each country can be clearly placed on a scale with respect to all other countries. However, because of random variation from year to year, we would expect countries with similar performance on a given indicator to have small differences in values from year to year. One option for emphasising this random variation is to add confidence intervals for all indicator values. In this report, confidence intervals are used for maternal mortality ratios because the variability is very marked for some countries. Because adding confidence intervals makes figures more complex, however, we have not included them elsewhere. Nonetheless, as mentioned above, some graphs include information on the number of births to highlight differences in population sizes between countries. Another problem with sorting indicators is that it is not possible to sort countries with no data. Identifying gaps in surveillance capacity is one of key objective of Euro-Peristat and presenting countries alphabetically highlights missing information.

Another issue in reporting European data concerns how to summarise each indicator for Europe overall. Providing an average of the indicators for all countries is not very meaningful, as this will be affected by outliers and because the number of countries providing data differ depending on the indicator. A Europe-wide value based on all contributed births is also not ideal, as a few large countries would account for a disproportionate number of births. As a solution, we have provided median values and information about the range of values (interquartile and overall). To assess Europe-wide changes between 2010 and 2015, we also estimated pooled risk ratios with meta-analysis techniques. These statistical techniques, which integrate information about the variability in population size, are appropriate for evaluating trends across Europe. We report a random effects pooled risk ratio, calculated with the method of DerSimonian and Laird, which is interpretable as the association in an average country in Europe. Meta-analysis also makes it possible to provide a statistical measure of the heterogeneity in indicator values throughout Europe. We report the I^2 statistic, which provides an estimate of the proportion of the variation from country to country due to real differences and not just chance variation. Finally, we also present data with maps that illustrate geographic patterns in the distribution of the indicators. In these maps, countries are classified into six groups based on the geometrical interval classification method (ArcGIS 10.5).

KEY POINTS

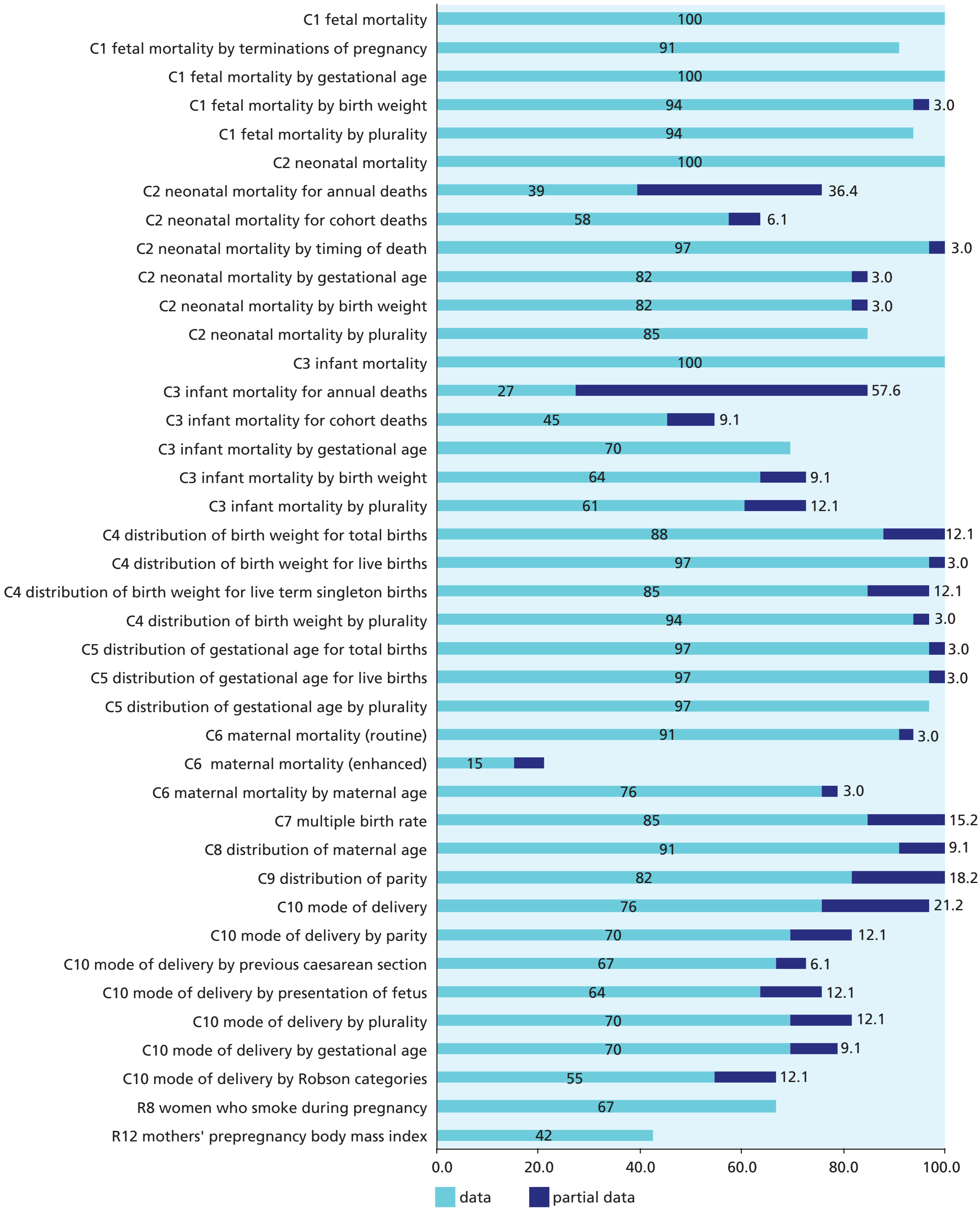
- The strengths of the Euro-Peristat indicators are their standardised definitions, the uniform collection of aggregated data, and the expertise brought to data collection and interpretation by Euro-Peristat Scientific Committee members and data providers, who are statisticians, epidemiologists, health researchers, physicians, midwives, and university researchers.
- All data were checked, based on a protocol involving several rounds of internal validation within the network.
- This and the previous Euro-Peristat reports testify to the feasibility and importance of the collection of indicators of maternal and infant health and of routinely compiling currently available data.
- Euro-Peristat also highlights shortcomings in current routine data systems, which must be considered in interpreting variation between countries.
- Regular reporting of perinatal health indicators on a European level makes it possible to identify these weaknesses and to encourage countries to make changes to obtain better statistics on maternal and newborn health.
- The use of Euro-Peristat data for research, by public health policy planners and public health specialists, confirms the importance of routinely compiling available perinatal health data for the surveillance of trends in risk factors and outcomes.

Table 2.2 Main sources of data used by Euro-Peristat

	Register Data			Other				
Country	Births in 2015* (N)	Civil registration/ vital statistics	Medical birth register or child health system	Hospital discharge system	Routine survey	Confidential enquiry	Professional registry	Linked data
Belgium	122 838	x						Yes
Bulgaria (2014)	68 079	x	x	x				No
Czech Republic	111 162	x	x	x				No
Denmark	57 847	x	x	x				Yes
Germany	728 825	x	x					Yes
Estonia	13 961	x	x	x				Yes
Ireland	65 913	x	x			x		No
Greece	92 159	x						No
Spain	421 590	x						No
France	761 880	x		x	x	x		No*
Croatia	37 428	x	x					Yes
Italy	486 557	x	x	x	x		x	Yes
Cyprus	9425	x	x					Yes
Latvia	21 826	x	x					Yes
Lithuania	31 601	x	x					Yes
Luxembourg	6862	x	x					Yes
Hungary	92 206	x						Yes
Malta	4453	x	x				x	No
Netherlands	169 234		x			x	x	Yes
Austria	83 884	x	x	x				Yes
Poland (2014)	376 968	x		x				No
Portugal	86 048	x		x				No
Romania	201 760	x		x				Yes
Slovenia	20 336	x	x					No
Slovakia	55 824	x						No
Finland	55 759	x	x					Yes
Sweden (2014)	115 710	x	x	x			x	Yes
United Kingdom						x		Yes
UK: England and Wales	698 970	x						Yes
UK: England	645 244	x		x				Yes
UK: Wales	32 338	x		x				Yes
UK: Scotland	54 513	x		x				Yes
UK: Northern Ireland	24 544	x	x					Yes
Iceland	4098	x	x					Yes
Norway	59 928	x	x					Yes
Switzerland (2014)	85 206	x		x				Yes

Note: *Linkage was used for enhanced maternal mortality data in France, but the other data are not linked.
Figure 2.1 Data availability for core and two recommended Euro-Peristat indicators in 2015

Figure 2.1 Data availability for core and two recommended Euro-Peristat indicators in 2015



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3 CHARACTERISTICS OF CHILDBEARING WOMEN

3. CHARACTERISTICS OF CHILDBEARING WOMEN

CORE

Multiple birth rate by number of fetuses (C7)
Distribution of maternal age (C8)
Distribution of parity (C9)

RECOMMENDED

Percentage of women who smoke during pregnancy (R8)
Distribution of maternal prepregnancy body mass index (R12)

RECOMMENDED INDICATORS NOT INCLUDED IN THIS REPORT

Distribution of mothers' educational level (R9)
Distribution of parents' occupational classification (R10)
Distribution of mothers' country of birth (R11)

The demographic and social characteristics of childbearing women are related to a wide range of pregnancy outcomes, including mode of delivery and maternal and neonatal mortality and morbidity. Interpreting variations in indicators of obstetric and neonatal care and outcomes between countries requires information about the characteristics of the population of pregnant women.

Euro-Peristat selected three core indicators, considered essential for describing the childbearing population – women with multiple pregnancies, maternal age, and parity – as well as five recommended indicators. Although this report focuses on the core indicators, we also present data on two of the recommended indicators – smoking and maternal prepregnancy BMI. The other three recommended indicators – mother's educational level, parental occupational status, and mother's country of birth – will be published later.

In the following section we introduce each indicator and describe the rationale for the choice and its impact on perinatal outcomes. The three recommended indicators that are not presented provide important information on the social context, which affects perinatal outcomes within countries and therefore provides a measure of social inequalities in health. Euro-Peristat has shown with data from 2010 that stillbirth rates throughout Europe are higher among women with lower educational or occupational levels (see section on stillbirth, C1).

C7 MULTIPLE BIRTHS BY NUMBER OF FETUSES

JUSTIFICATION

Compared with singletons, babies from multiple pregnancies have much higher rates of stillbirth, neonatal mortality, infant mortality, preterm birth, low birth weight, congenital anomalies, and long-term health and developmental problems associated with complications of the perinatal period. Rates of multiple birth vary between countries and over time. They are influenced by differences in the proportions of older women giving birth (see C8), because the probability of a multiple pregnancy increases with age. Older women also experience more subfertility and are more likely to use ART. The extent of use of ovarian stimulation and assisted conception and the policies for preventing multiple pregnancies with ART are therefore also major determinants of rates of multiple pregnancy in the population. Use of subfertility procedures is rising across Europe and policies related to their use differ from country to country;[4] for instance, elective single embryo transfer (eSET) has been extensively promoted in several countries, including Belgium, the Czech Republic, Sweden, Finland, and Austria, and recent studies comparing the use of eSET between countries show its impact on the incidence of multiple pregnancies.[5]

DEFINITION AND PRESENTATION OF INDICATOR

Figure 7.1 shows the rates of twin and triplet and higher-order births, expressed as numbers of women with twin and with triplet or higher-order births per 1000 women giving birth to one or more fetuses.

DATA SOURCES AND AVAILABILITY OF INDICATOR IN EUROPEAN COUNTRIES

All countries provided data for this indicator. Greece, Hungary, and Romania provided data by births and not by pregnant women, so we estimated the rates of multiple maternities from birth data (by dividing by 2 for twins and 3 for triplets). Data came primarily from medical birth registers and perinatal databases as well as from civil registration systems. Most countries had no missing data or a very minimal number of women with missing data.

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

The pregnancies included in civil registration systems depend on the laws governing the births requiring registration. These affect the extent to which multiple births in which one or more babies die before birth or registration are included. In addition, multiple births are rare events. In small populations such as those of Cyprus, Iceland, Luxembourg, and Malta, year-to-year random variations will be greater and confidence intervals around the rates wide. In comparing these data with other data sources, it is important to note that the multiple birth rate is sometimes presented with births as the denominator (rather than pregnant women, as in the Euro-Peristat definition).

RESULTS

Multiple birth rates varied from below 15 per 1000 women with live births or stillbirths in Romania, Slovakia, Poland, Greece, Finland, Lithuania, Scotland, Northern Ireland, and the Czech Republic to more than 20 per 1000 in Cyprus (27/1000) and Spain (22/1000) in 2015, as shown in Figure C7.1, which also provides the number of women in each country with information on this indicator. For triplets and more, Cyprus had the highest rate (0.9/1000) in 2015, and Greece, Estonia, Slovakia, the Czech Republic, Latvia, and Finland the lowest rates (around 0.1/1000). The median twin rate was 16.4/1000 with an interquartile range (IQR) between 14.5 and 17.4, and the triplet rate was 0.2 per 1000 with an IQR of 0.2 to 0.3. Median rates were similar for 2010, 16.4 per 1000 and 0.3 per 1000, respectively, but changes over time differed. Figure C7.3 presents risk ratios between the two years with 95% confidence intervals for twin pregnancy rates; significant decreases of 10% or more in twinning rates were observed in Austria, Slovakia, Finland, Denmark, and the Czech Republic. Increases of 10% or more were observed in Ireland, Romania, Portugal, and Latvia. The heterogeneity between countries in rates between the two periods was statistically significant.

KEY POINTS

- Perinatal complications associated with multiple births impose considerable costs on health services, families, and societies. Accordingly, the high rates due to either delayed childbearing or subfertility management raise questions about the need for policies to encourage earlier childbearing and to prevent multiple pregnancies in assisted conception.
- The decrease in twinning rates in some countries may be the result of policies to reduce the risks of multiple births for women undergoing subfertility procedures; more knowledge about how these policies are contributing to the changes in the multiple birth rate would be useful for health professionals and policy makers.
- In the absence of data about ovarian stimulation and assisted conception, age-specific multiple birth rates can provide an indication of the extent of their use.

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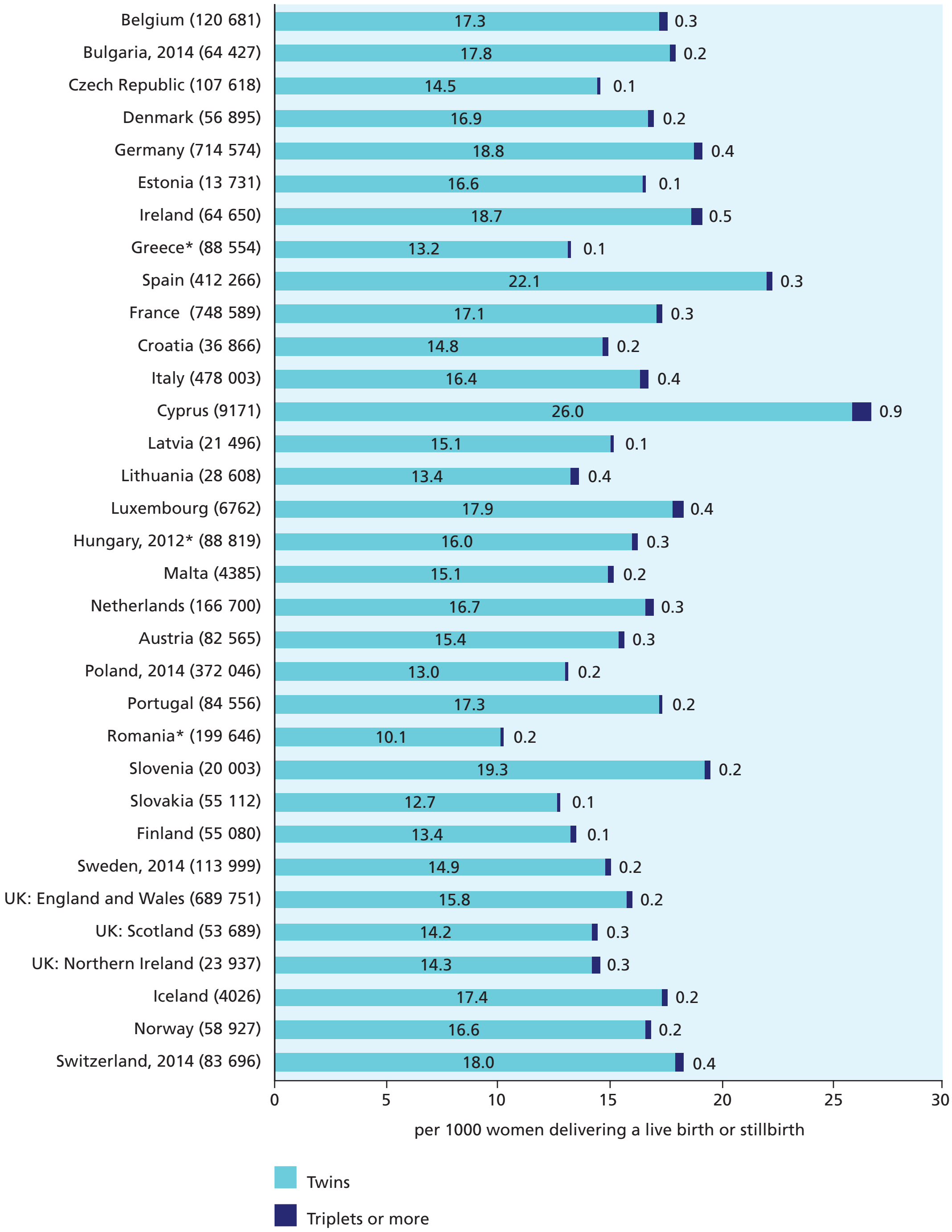
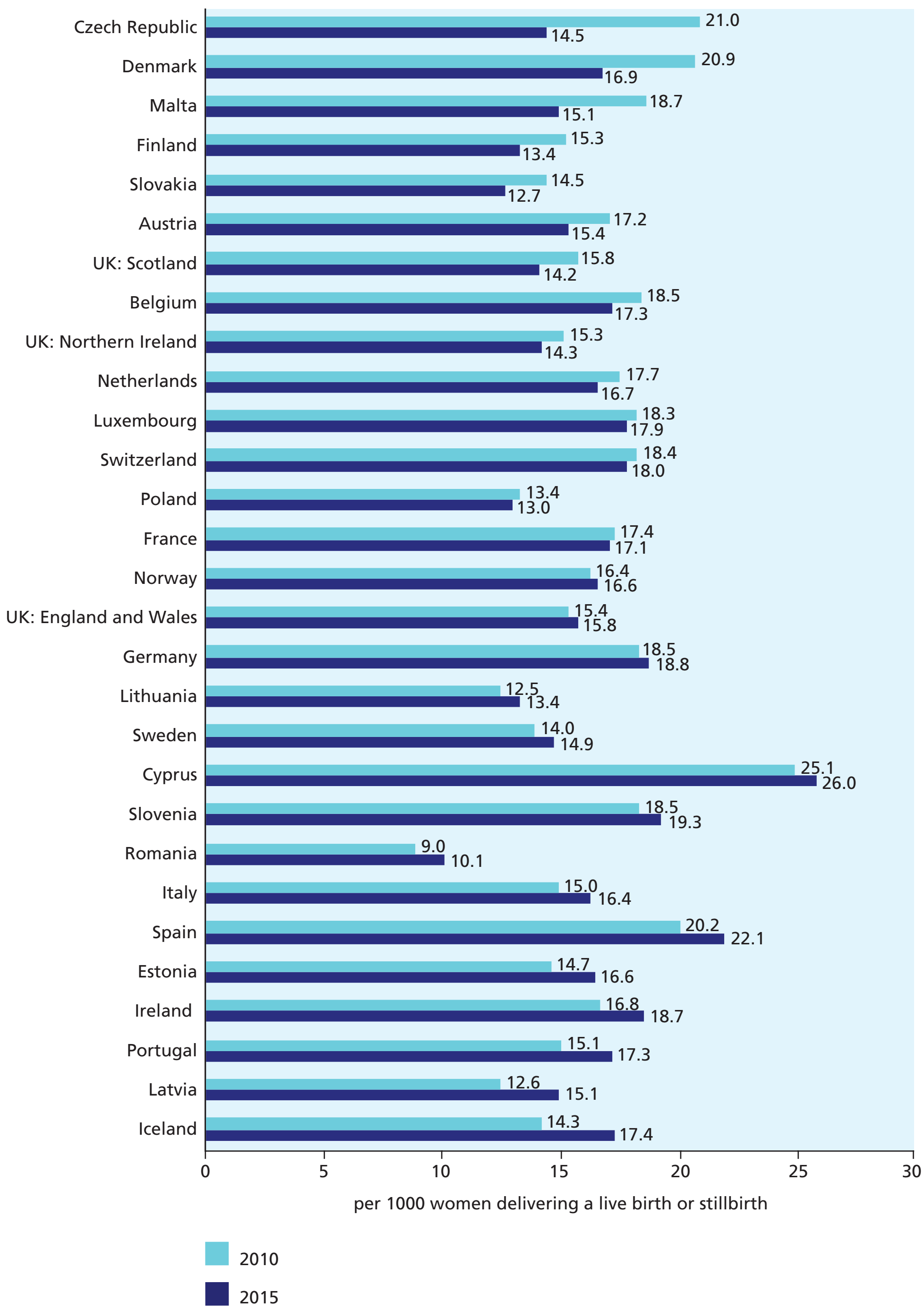
Figure C7.1 **Multiple birth rates per 1000 women with live births or stillbirths by number of fetuses in 2015**



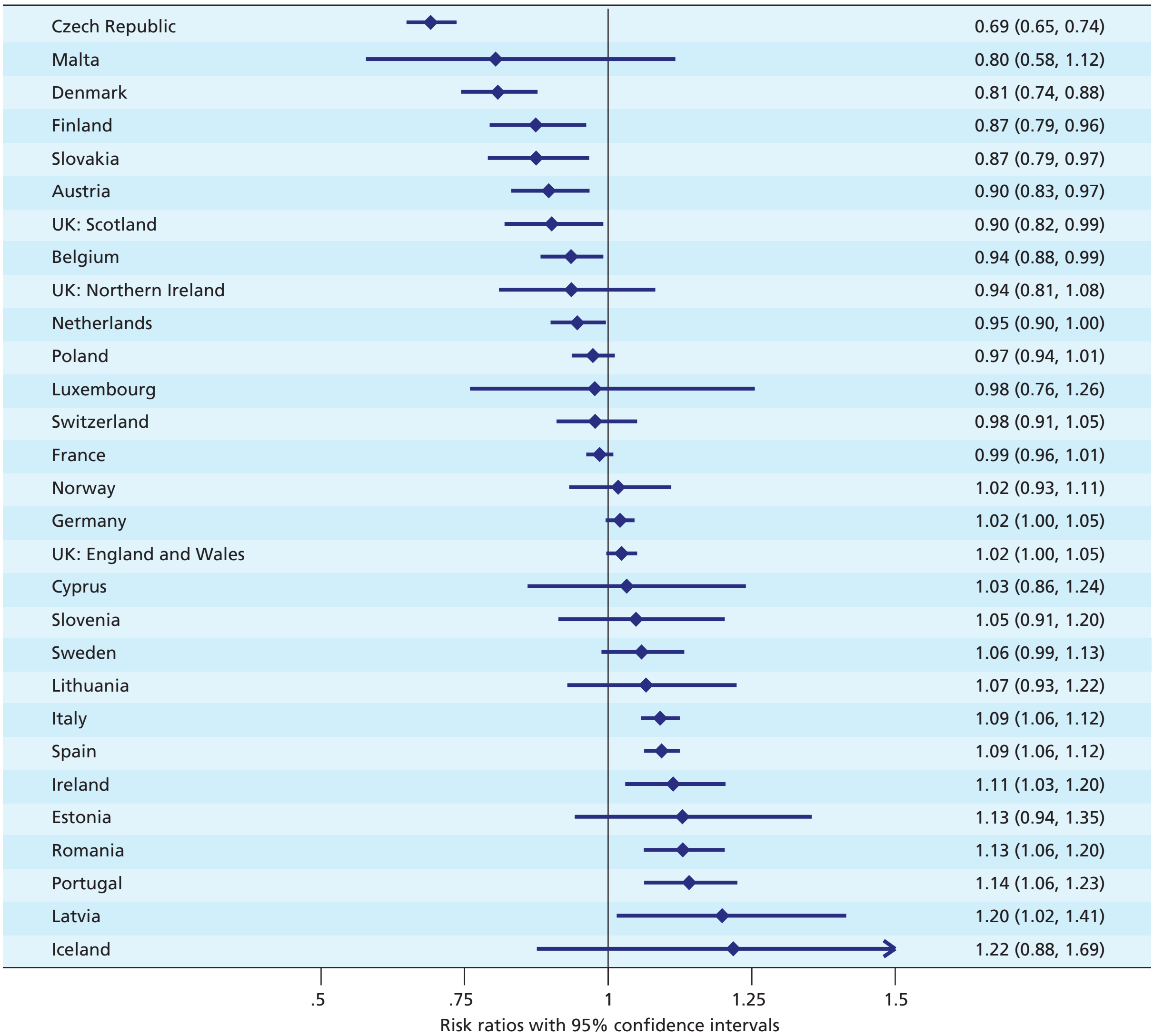
NOTE: Numbers in parentheses are number of women for whom there were data about multiple pregnancy (all stated).
* Estimated from data on babies.

Figure C7.2 Twin birth rates per 1000 women in 2010 and 2015



NOTES: Countries sorted by rate difference between 2010 and 2015.
First-period data not from 2010: Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Hungary 2012, Poland 2014, Sweden 2014, Switzerland 2014.

Figure C7.3 Comparison of twin pregnancy rates, 2010 and 2015 (risk ratios and 95% confidence intervals)



NOTE: Overall random effects estimate: 0.99 (95% CI: 0.95, 1.03).
I^2=92.6% Chi squared tests of heterogeneity: 378.65 (d.f. = 28), p <.001.
First-period data not from 2010: Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Hungary 2012, Poland 2014, Sweden 2014, and Switzerland 2014.

C8 MATERNAL AGE AT DELIVERY

JUSTIFICATION

Both early and late childbearing are associated with higher than average rates of preterm birth, growth restriction, and perinatal mortality.[1-4] Younger mothers are more likely to have low social status, unwanted or hidden pregnancies, inadequate antenatal care, and poor nutrition. Older mothers have a higher risk of multiple births, as described in indicator C7, of some congenital anomalies, and of pregnancy complications, including hypertension and diabetes. Maternal morbidity and mortality are highest among the youngest and oldest women. Older mothers have caesarean deliveries more often. The risks of younger age are mainly observed among very young mothers.[4] For older mothers, risks rise more acutely after age 40.[5]

Because of the association between maternal age and perinatal health outcomes and because the age at which women in European countries bear children differs widely, the maternal age distribution should be taken into account in comparisons between countries. Furthermore, mothers are increasingly having children later in life throughout Europe, and this could affect trends in perinatal health indicators.

Policy issues include integrating into prenatal care services that address the specific needs of older pregnant women and providing information about the risks associated with early and delayed childbearing. Younger mothers may be exposed to less favourable social conditions, which have long-term consequences for themselves and their children. The prevention of teenage pregnancy is a policy concern in some countries of Europe, but many others have already attained very low rates.[6] The challenges of managing later childbearing are widely shared across European countries.

DEFINITION AND PRESENTATION OF INDICATOR

This indicator is defined as the distribution of age in years at delivery for women delivering a live born or stillborn baby. The recommended presentation is: 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45 and older. This summary presentation focuses on the extremes of the childbearing distribution, defined as younger than 20 years and 35 years and older.

METHODOLOGICAL ISSUES IN THE CALCULATION, REPORTING, AND INTERPRETATION OF THIS INDICATOR

Some civil registration systems record the age the mother reaches during the year of birth and not her age at delivery. In some situations, age may be recorded during antenatal visits but not updated at delivery. These data are presented in relation to total births in the Czech Republic and Greece and to live births in Hungary and Romania, rather than to women, as recommended by Euro-Peristat. The differences between these two numbers are due to multiple births, which are a relatively small proportion of total births even among women aged 35 or more, so this is not a major problem.

Data in France come from hospital statistics in 2015 and also from a representative survey in 2016, to enable a comparison with data provided in 2010, which came from the 2010 version of the same survey.

DATA SOURCES AND AVAILABILITY OF INDICATOR IN EUROPEAN COUNTRIES

All countries were able to provide this indicator. Data correspond to births in 2014 in Bulgaria, Poland, Sweden, and Switzerland and in 2016 in France for the comparison with 2010.

RESULTS

The percentage of mothers aged younger than 20 varied from 0.8% in Switzerland to 10.2% in Bulgaria. This percentage was 9.7 in Romania, 6.3 in Hungary and Slovakia, and under 4 in the other countries (Figure C8.1). The median percentage was 2.1% with an IQR of 1.4% to 3.5%. The percentage of older mothers, defined as women giving birth at 35 years or older, ranged from about 14% in Bulgaria, Poland, and Romania to 36.3% in Italy and 37.3% in Spain. The median for all countries was 20.8, with an IQR of 18.8 to 22.8. The group of women aged between 25 and 34 years, at the lowest perinatal risk, is proportionally small (53% to 55%) in Bulgaria and Hungary because of the high proportion of women under 25, and in Ireland, Spain, and Italy because of the high proportion of births to women aged 35 or more.

Figures C8.2 and C8.3 provide a geographical representation of the distribution of maternal age at childbirth in participating countries based on the percentages of younger and older mothers. These figures show clustering of countries in eastern Europe, where women are having children at earlier ages, as well as higher proportions of older mothers in southern Europe.

Having children later in life is a general trend in Europe (Figure C8.4). Only four countries (Estonia, Germany, the Netherlands, and Sweden) experienced a decrease between 2010 and 2015 in the percentage of women aged 35 years or more, and the absolute decrease was less than 1%. The increase was large with an absolute increase of about 8% in Portugal and Spain. This change is more pronounced when seen as a relative change, as in Figure C8.5, which presents risk ratios between the two years with 95% confidence intervals. The pooled measure of change for all the countries participating in Euro-Peristat is 1.16 (1.11-1.20), with highly significant heterogeneity.

KEY POINTS

- In more than 60% of the countries in Euro-Peristat, births to teenage mothers account for less than 3% of all deliveries.
- The proportion of women bearing children later in life varies substantially but in over 60% of countries, at least one in every five births was to a women aged 35 years or older, and the percentage of births to women in this age group increased substantially in almost every country.
- Policies should be developed to inform young women of the consequences of having children later in life so that they can make informed choices about when to have their children.
- Encouraging earlier childbearing may also require policies to support young parents and working mothers. Health services in countries with a higher percentage of women having babies at older ages need to make sure their health needs are met during pregnancy.

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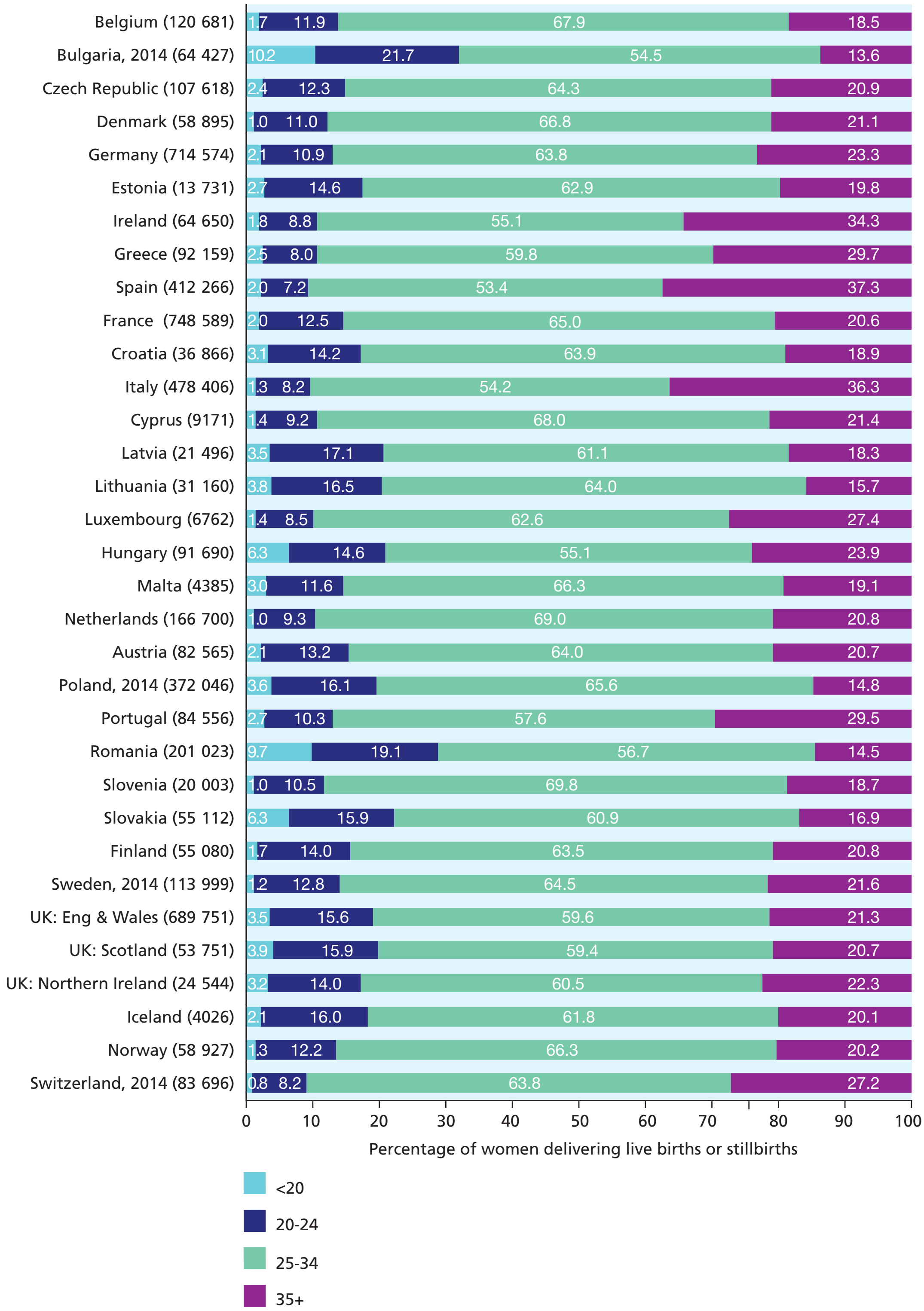
Figure C8.1 **Age distributions of women delivering live births or stillbirths in 2015**



NOTE: In parentheses: the number of women with data for age at delivery.

Figure C8.2 Mothers aged <20 years as a percentage of all pregnancies with known maternal age in 2015

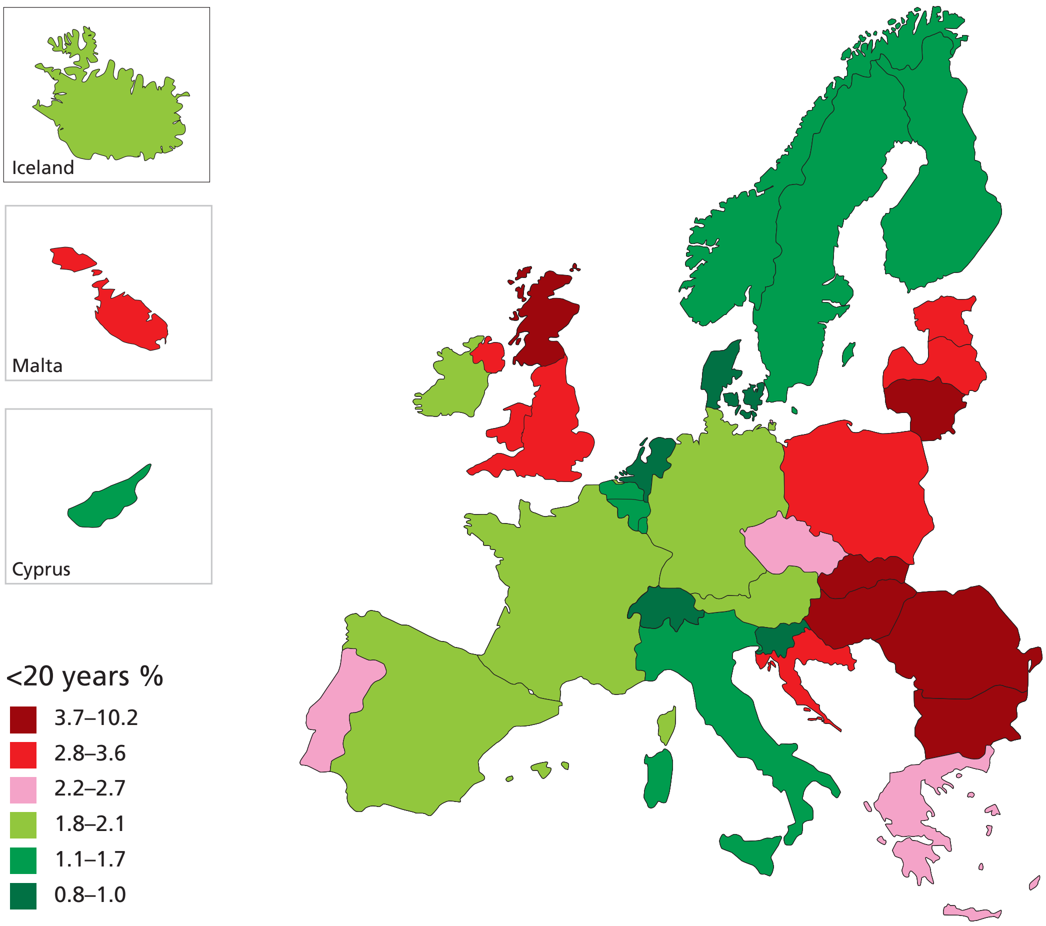


Figure C8.3 **Mothers aged ≥ 35 years as a percentage of all pregnancies with known maternal age in 2015**

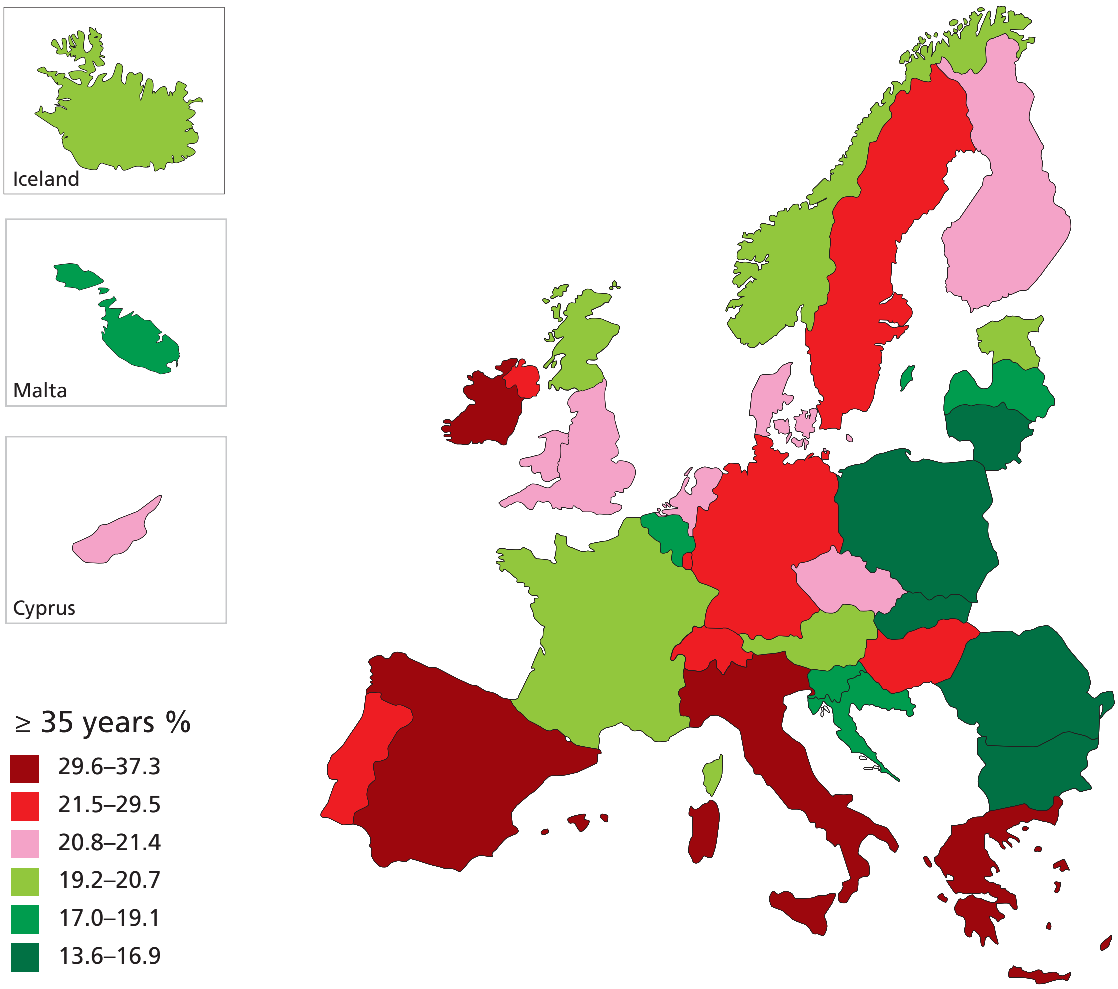
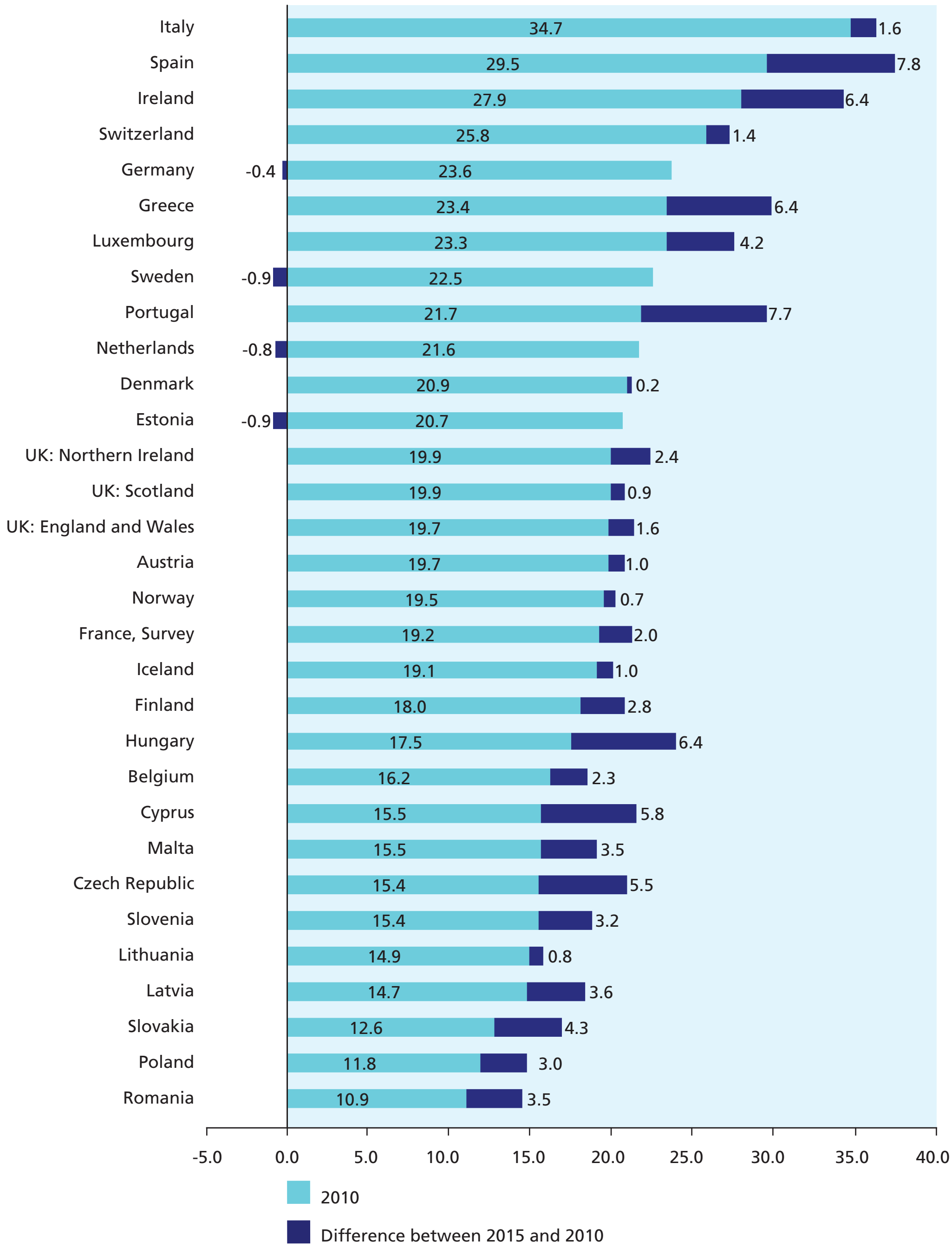
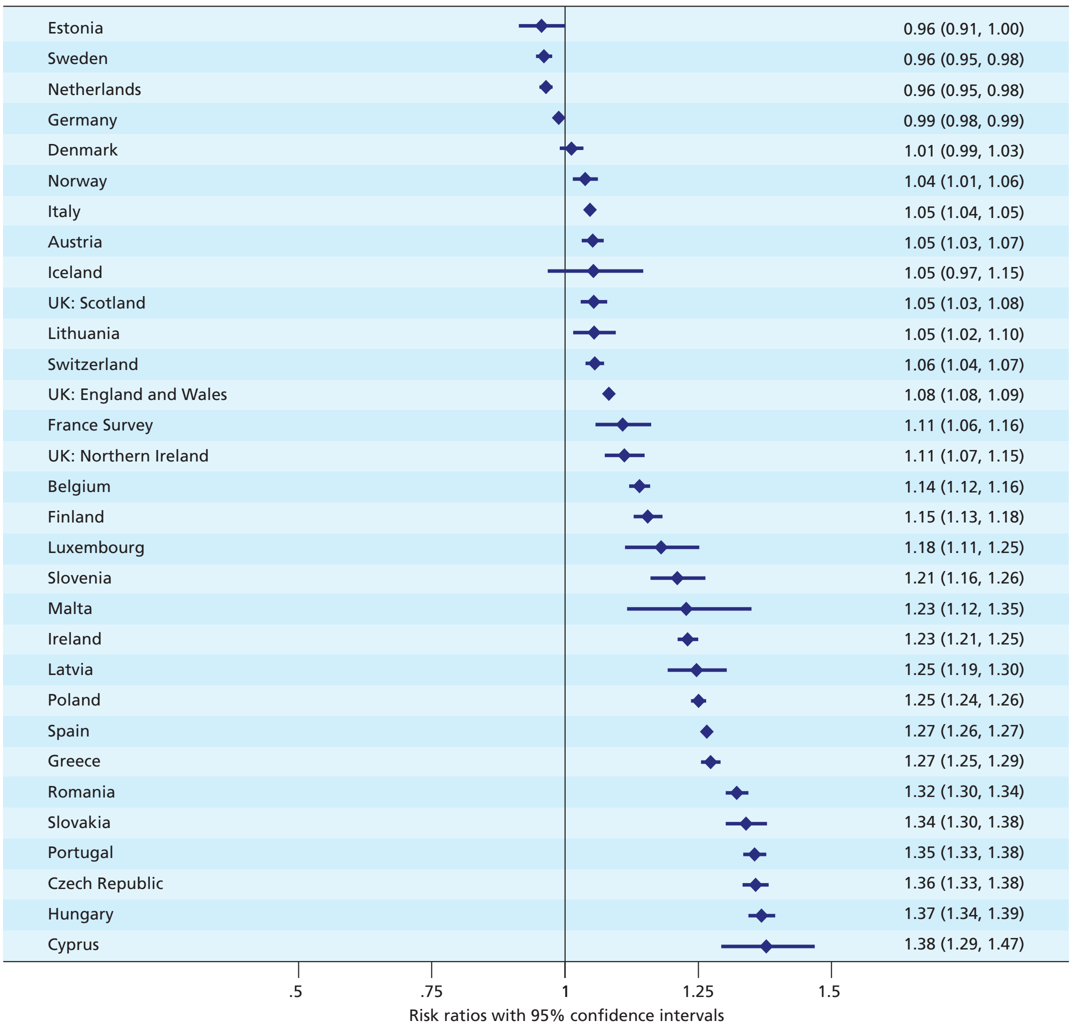


Figure C8.4 **Percentage of mothers aged ≥ 35 years in 2010 and differences between 2010 and 2015**



NOTES: First-period data not from 2010: Greece 2009, Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Poland 2014, Sweden 2014, Switzerland 2014.

Figure C8.5 Comparison of the percentages of mothers aged ≥ 35 years, 2010 and 2015 (risk ratios and 95% confidence intervals)



NOTE: Pooled random effects estimate: 1.16 (95% CI: 1.11-1.20).
I^2=99.6% Chi squared tests of heterogeneity: 7611.48 (d.f. = 30), p < 0.001.
First-period data not from 2010: Greece 2009, Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Poland 2014, Sweden 2014, Switzerland 2014.

C9 DISTRIBUTION OF PARITY

JUSTIFICATION

Parity refers to a women's number of previous births. Women with no previous births and giving birth for the first time are described here as primiparous and women with one or more previous births as multiparous. Compared with multiparous women, primiparous women have a higher incidence of some pregnancy complications and conditions, such as hypertension and preeclampsia, as well as higher than normal risks of adverse outcomes, such as low birth weight, fetal growth restriction, preterm birth, and stillbirth.[1,2] Primiparity is also associated with a greater use of health services during pregnancy and with health behaviour, including greater adherence to recommendations about folic acid supplementation, smoking cessation, and attendance for antenatal care.[3-5] Use of obstetric interventions differs as well. Primiparous women have higher rates of caesarean births than multiparous women, although the magnitude of this difference differs between countries (see C10).[6] Caesarean delivery in the first pregnancy has a major impact on the risk of caesareans in subsequent pregnancies, with caesarean rates for multiparous women with a uterine scar ranging from 40% to 94% in Euro-Peristat countries in 2010.[6] Similar trends appear for 2015 (see C10). Grand multiparae, defined as women with 4 or 5 previous births, may also face greater risks of poor pregnancy outcome, although this has not been observed in all studies.[2,7]

Fertility patterns influence the distribution of parity, and countries with lower fertility rates will have higher proportions of primiparous women. Parity should therefore be considered in comparing health outcomes between low and high fertility countries or across time when fertility is changing, for it may mean higher overall rates of adverse outcomes in populations where fertility is lower.

DEFINITION AND PRESENTATION OF INDICATOR

Parity is defined as the number of previous total live births and stillbirths (0, 1, 2, or 3+ births) for women having a live birth or a stillbirth.

DATA SOURCES AND AVAILABILITY OF INDICATOR IN EUROPEAN COUNTRIES

Most countries were able to provide data on parity. Greece, Hungary, Romania, and Bulgaria provided data on parity at the level of the child (number of births) rather than the mother. Spain could provide the proportions of primiparous and multiparous women, but did not have details about the number of previous births for multiparous women. Most countries had low proportions of missing data.

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

There are differences in the definition of parity related to the way in which previous multiple births are counted.[8] In obstetrics, previous births most often refer to the number of pregnancies,[9] meaning that twins would be counted as one birth whereas demographers and some health databases tend to refer to number of babies, ie, twins are counted as two births.[10] When extracting data from routine sources it is usually not possible to distinguish which of these definitions are used, and there is confusion among clinicians about how to measure parity.[8] Data from Finland, where it is possible to compute this indicator based on both definitions, however, show that the difference in definition does not have a large impact on the distribution of this indicator (Table C9.1). When the number of births is used, there are slightly more high-parity women.

Other issues are related to the omission of stillbirths, as many civil registration systems do not count previous stillbirths as a birth in the computation of parity (for instance, Switzerland); similarly, there are different gestational age cutoffs for defining what constitutes a birth. This may differ between countries, for instance, starting at 20 weeks, 22 weeks, or 24 weeks. Nonetheless, these births are infrequent and unlikely to have a large impact.

RESULTS

The percentages of women giving birth for the first time ranged from lows of 38%-39% in Ireland, Northern Ireland, and England and Wales to over 50% in Bulgaria, Italy, Portugal, Spain, Malta, and Romania, as shown in Figure C9.1. The median in participating European countries was 47.6%. Fewer than 3% of women had three or more previous births in Italy, Portugal, Slovenia, or Switzerland, compared with 9% or more in Ireland, Slovakia, Finland, and the UK (England, Wales, and Northern Ireland). The percentage of women with four or more previous births ranged from less than 1% to over 4% in Slovakia, Finland, and Romania (see Table C9 in Appendix B).

Figure C9.2 displays the percentages of primiparous women in 2010 and their differences in 2010 and 2015. For most countries, there was a slight decrease or no change. In Latvia, Scotland, the Netherlands, Ireland, Sweden, and Northern Ireland, however, the percentage of primiparous mothers decreased by 3 percentage points. Absolute increases of close to 2 percentage points were seen in Slovakia and Denmark. Figure C9.3, which presents risk ratios between the two years with 95% confidence intervals, illustrates the larger number of countries experiencing slight decreases. The pooled measure of change across all the countries in Europe is 0.98 (0.97-0.99), with highly significant heterogeneity.

KEY POINTS

- As fertility is relatively low in Europe, more attention is paid to women giving birth for the first time and the risks associated with it than to women with several previous births.
- The percentage of primiparous women ranges from about 38% to 54% in participating countries, and this may affect perinatal indicators, given the higher risks, on average, experienced by women in their first pregnancy.
- Since 2010, the percentage of primiparous women among all childbearing women has decreased slightly or stayed stable in most countries.

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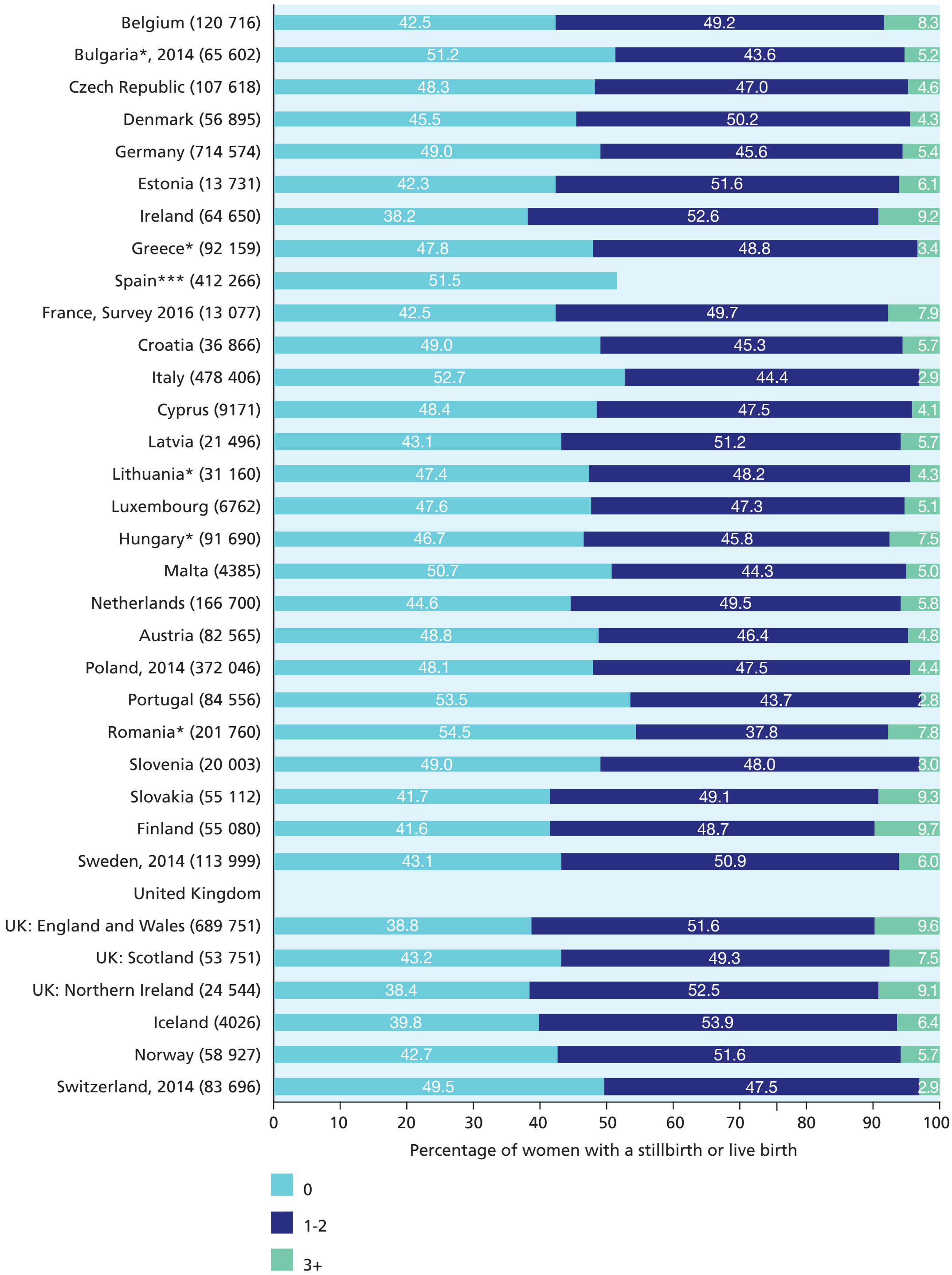
Table C9.1: Differences in distribution of parity when calculated based on previous deliveries or previous births in Finland in 2015

	Previous deliveries (pregnancies)		Previous births (babies)	
	N	%	N	%
0	22 856	41.6	22 856	41.6
1	18 885	34.3	18 746	34.1
2	7921	14.4	7839	14.3
3	2684	4.9	2627	4.8
4 or more	2661	4.8	2939	5.3

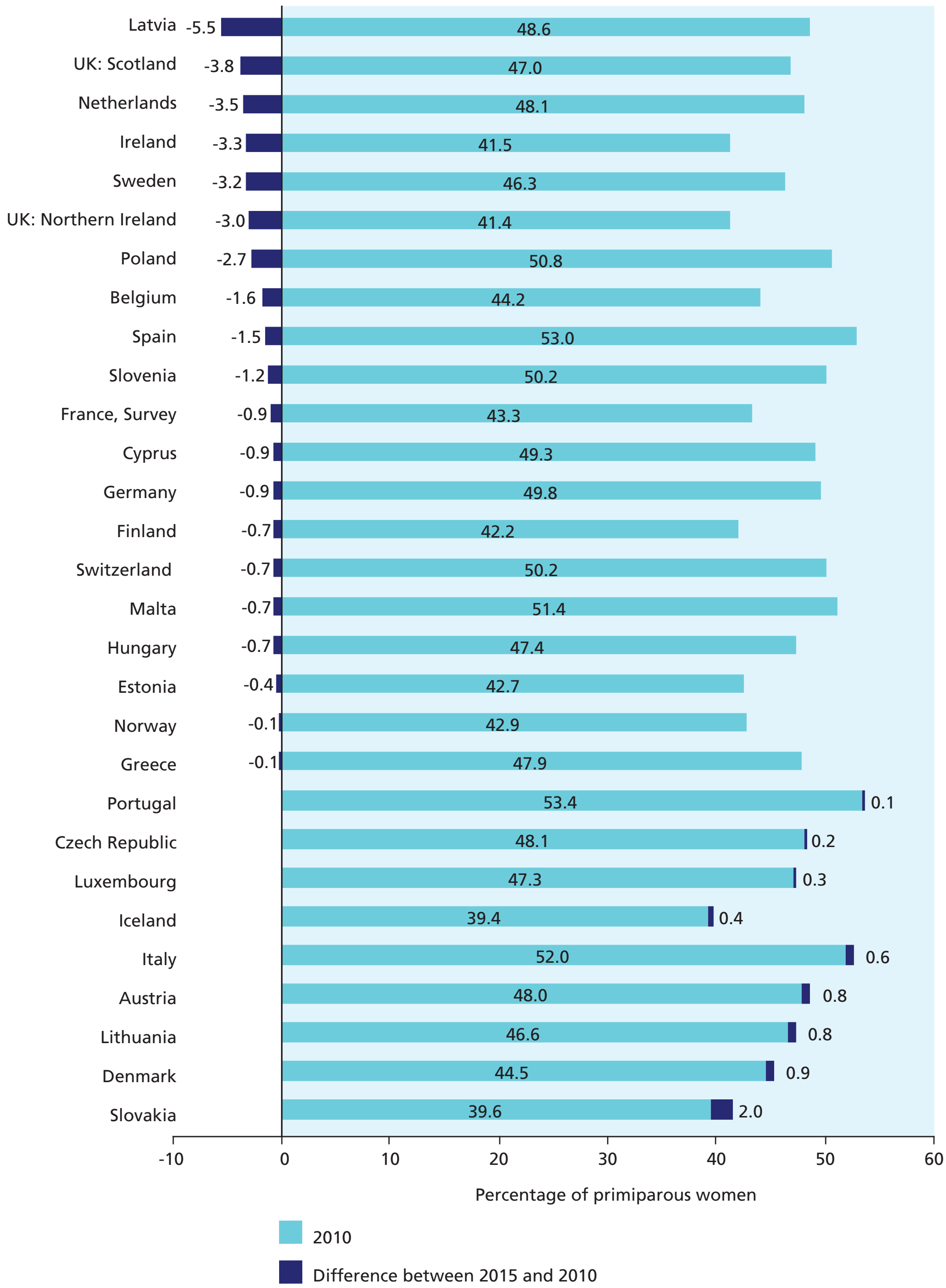
Source: National Institute for Health and Welfare, Medical Birth Register 2015. Data on previous deliveries are based on mothers' self-report, verified from the Medical Birth Register. Data on previous births come from the Medical Birth Register 1987-2015, which takes live births and stillbirths in multiple pregnancies into account.

Figure C9.1 Distribution of parity in 2015



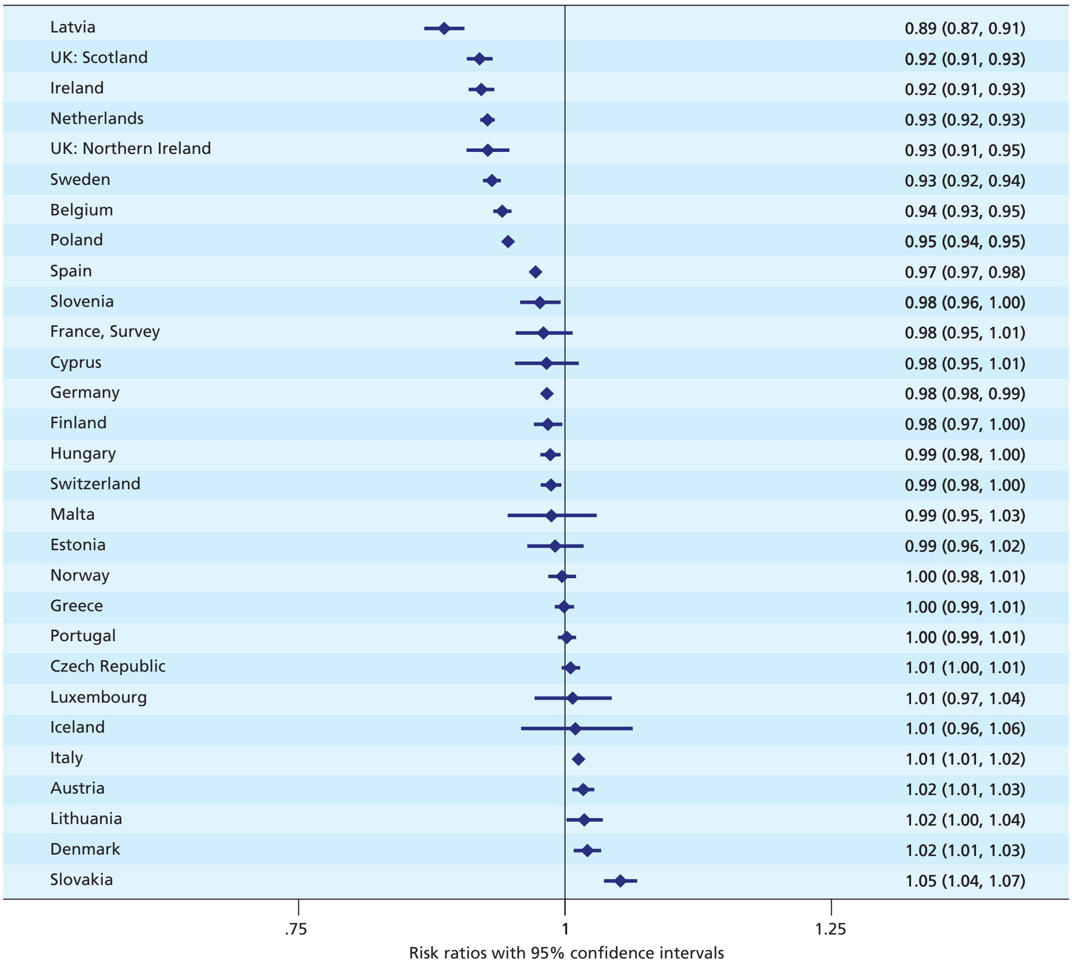
Notes: * Based on babies not mothers.
** Based on live births only.
*** Can only identify primiparous vs. multiparous
(numbers in parentheses: women with live births and stillbirths)

Figure C9.2 Differences between the percentages of primiparous mothers in 2010 and 2015



NOTE: Countries sorted by rate difference between 2010 and 2015.
First-period data not from 2010: Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Poland 2014, Sweden 2014, Switzerland 2014.

Figure C9.3 **Comparison between the percentages of primiparous women, 2010 and 2015 (risk ratios with 95% confidence intervals)**



NOTE: Pooled random effects estimate: 0.98 (95% CI: 0.97-0.99).
I^2=98.2% Chi squared tests of heterogeneity: 1556.24 (d.f. = 28), p < 0.001.
First-period data not from 2010: Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Poland 2014, Sweden 2014, Switzerland 2014.

R8 SMOKING DURING PREGNANCY

JUSTIFICATION

Maternal smoking is one of the most important preventable factors associated with adverse pregnancy outcome. Maternal smoking during pregnancy impairs normal fetal growth and development and is associated with low birth weight, fetal growth restriction, stillbirth, preterm birth, and some congenital anomalies.[1-3] Moreover, its influence on outcomes is not limited only to the perinatal period; increasing evidence suggests it also has lifelong consequences for the child, with elevated risks of childhood obesity, neurobehavioural and cognitive deficits, and impaired lung function, including wheezing and asthma.[4-7]

Smoking among pregnant women has declined in high-income countries, but it nonetheless continues to account for a substantial proportion of fetal and infant morbidity and mortality. Smoking before pregnancy and the likelihood of stopping smoking are associated with lower maternal educational level and poverty. Smoking thus contributes to the creation of social inequalities in perinatal health.[8,9]

Public health interventions exist to reduce smoking and to tackle social inequalities in tobacco use.[10] A preventive population approach is important to reduce the prevalence of smoking before pregnancy in the childbearing population. Furthermore, smoking cessation interventions have been shown to be effective in improving pregnancy outcomes[11] and can serve as an indicator of the quality of antenatal preventive healthcare services.

DEFINITION AND PRESENTATION OF INDICATOR

Smoking during pregnancy is defined as the proportion of women who smoked during pregnancy among those with live born or stillborn babies. When possible, data were collected for two time periods: an earlier (ideally, first trimester) and a later (ideally, third trimester) phase.

DATA SOURCES AND AVAILABILITY OF INDICATOR IN EUROPEAN COUNTRIES

The data were provided by 19 of 31 countries. Some countries, including France and the Netherlands, provided data based on routine surveys. It is striking, however, that this important indicator of perinatal health as well as of the effectiveness of preventive public health policies is not available in many countries.

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

To be able to compare countries or regions or to evaluate time trends, a common time frame is essential. This is important because many women stop smoking during pregnancy. If a single measure is the most practical option, it should relate to the last trimester of pregnancy so that the length and timing of exposure can be taken into account. Many data sources include information on smoking in pregnancy, but without further clarification.

Differences in the type of data (antenatal care records, medical records in maternity units, and birth surveys including interviews with mothers before and after birth), as well as the questions asked are additional sources of potential bias. Accordingly, the quality of the information is variable. Some data sources may record a woman as a non-smoker if smoking is not recorded in medical records. The rate of missing data ranges from 0% (the Czech Republic, Latvia, Lithuania, Malta, and Slovenia) to 17% in Croatia, 19% in England, 25% in Austria, and 29% in Germany.

Finally, there is evidence that some women may under-report smoking, as they know that they should not be smoking during pregnancy. Misclassification and inaccurate estimates of smoking may thus result. Many of the data providers expressed reservations about the quality of these data because they were based on self-report, and missing data were not well recorded. Euro-Peristat does not collect information on amount smoked, so these data cover both women who smoked daily and those who smoked occasionally.

RESULTS

Table R8.1 presents information on the time periods covered by the data and the proportions of smokers during both periods. Eight countries provided information during pregnancy without clearly specifying the time period, 11 countries provided data for two periods (either before and during pregnancy or during the first and the second or third trimesters), 2 countries provided information on smoking prevalence early in pregnancy only. The prevalence of smoking in the second period (during pregnancy or in the last trimester) was between 5 and 8% in most countries providing data, but Norway, Sweden, and Lithuania reported prevalence rates below 5%, while more than 10% of pregnant women smoked in Valencia (18.3%), France (16.3%), Catalonia (13.0%), Austria (12.5%), the UK (between 12 and 17%), and Luxembourg (10.7%). When prevalence was available for two periods, the percentage of smokers was always lower closer to delivery.

Overall, in countries that provided data for 2010 and 2015, there were lower proportions of smokers during pregnancy in 2015, but in a few countries, prevalence was stable or rose slightly. Reductions of more than two percentage points were observed in Denmark, Estonia, Germany, Cyprus, Latvia, Luxembourg, Finland, and Norway. In Scotland, the data in 2015 relate to smoking at booking, whereas in 2010, the period was an unspecified moment during pregnancy. The pooled measure of change between 2010 and 2015 for all countries reflects the predominance of countries reporting decreases in smoking: 0.87 (95% confidence intervals: 0.79-0.95), but heterogeneity was highly significant.

KEY POINTS

- Not all countries could provide data on maternal smoking during pregnancy, and standardised collection procedures are necessary to improve comparability for those countries that did.
- In some European countries, more than 10% of women smoke during their pregnancy.
- Declines in maternal smoking during pregnancy were observed when recent data were compared with 2010, although there were differences in the magnitude of the decrease; policies should be reviewed in countries where smoking prevalence is high with only slight decreases.
- Given the adverse effects of smoking on fetal and infant health and since pregnancy care is considered an ideal setting for intervention, obtaining high quality and comparable information on smoking before and during pregnancy should be a priority.

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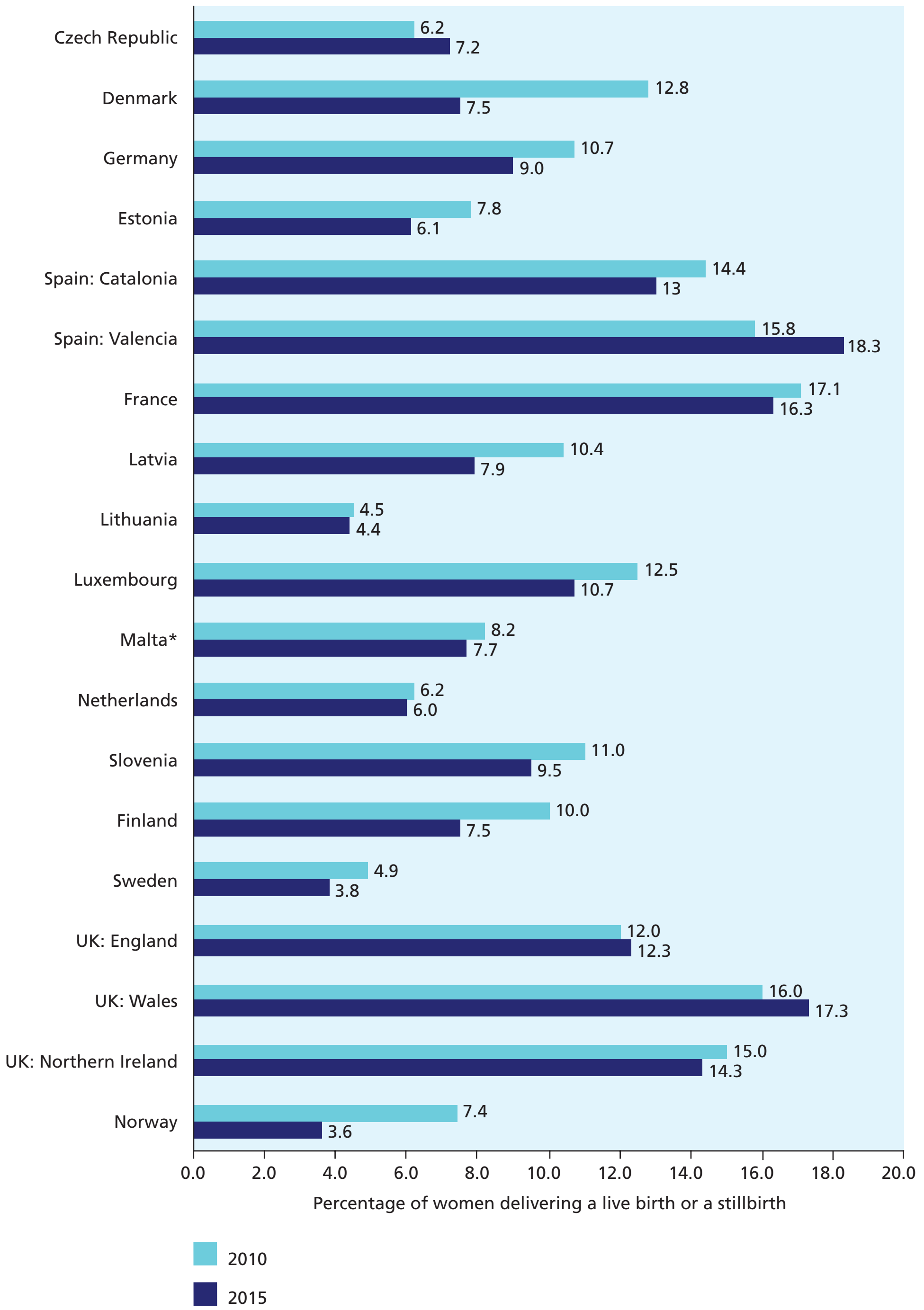
Table R8.1. **Percentages of women who smoked during pregnancy in 2010 and comparisons with 2015**

Time period			Smokers in 2015		Smokers in 2010	Time period
Country/ coverage	Period 1	Period 2	Period 1 %	Period 2 %	Latest period %	Latest period
Belgium						
Bulgaria						
Czech Republic		During pregnancy		7.2	6.2	during
Denmark	1st trimester	2nd trimester	11.0	7.5	12.8	during
Germany		During pregnancy		9.0	10.7	during
Estonia	1st trimester	During pregnancy	7.6	6.1	7.8	during
Ireland						
Greece						
Spain: Catalonia	Before pregnancy	3rd trimester	22.8	13.0	14.4	3rd trimester
Spain: Valencia		End of pregnancy		18.3	15.8	1st trimester
France	Before pregnancy	3rd trimester	29.8	16.3	17.1	3rd trimester
Croatia		During pregnancy		8.1		
Italy	Before pregnancy	During pregnancy	20.5	5.3		
Cyprus		During pregnancy		6.3	11.5	1st trimester
Latvia		During pregnancy		7.9	10.4	during
Lithuania	Before pregnancy	During pregnancy	8.0	4.4	4.5	during
Luxembourg	1st trimester	3rd trimester	13.3	10.7	12.5	3rd trimester
Hungary						
Malta	At booking		7.7		8.2	1st trimester
Netherlands		During pregnancy		6.0	6.2	after 1st trimester
Austria		3rd trimester		12.5		
Poland				N/A*	12.3	3rd trimester
Portugal						
Romania						
Slovenia		During pregnancy		9.5	11.0	during
Slovakia						
Finland	1st trimester	After 1st trimester	14.7	7.5	10.0	after 1st trimester
Sweden	1st trimester	3rd trimester	5.1	3.8	4.9	3rd trimester
United Kingdom				N/A	12.0	during
UK: England *	At booking	Delivery	14.2	12.3	12.0	during
UK: Wales*		3rd trimester		17.3	16.0	during
UK: Scotland	At booking		16.4		19.0	during
UK: Northern Ireland*		During pregnancy		14.3	15.0	during
Iceland						
Norway	First visit	End of pregnancy	5.5	3.6	7.4	3rd trimester
Switzerland						

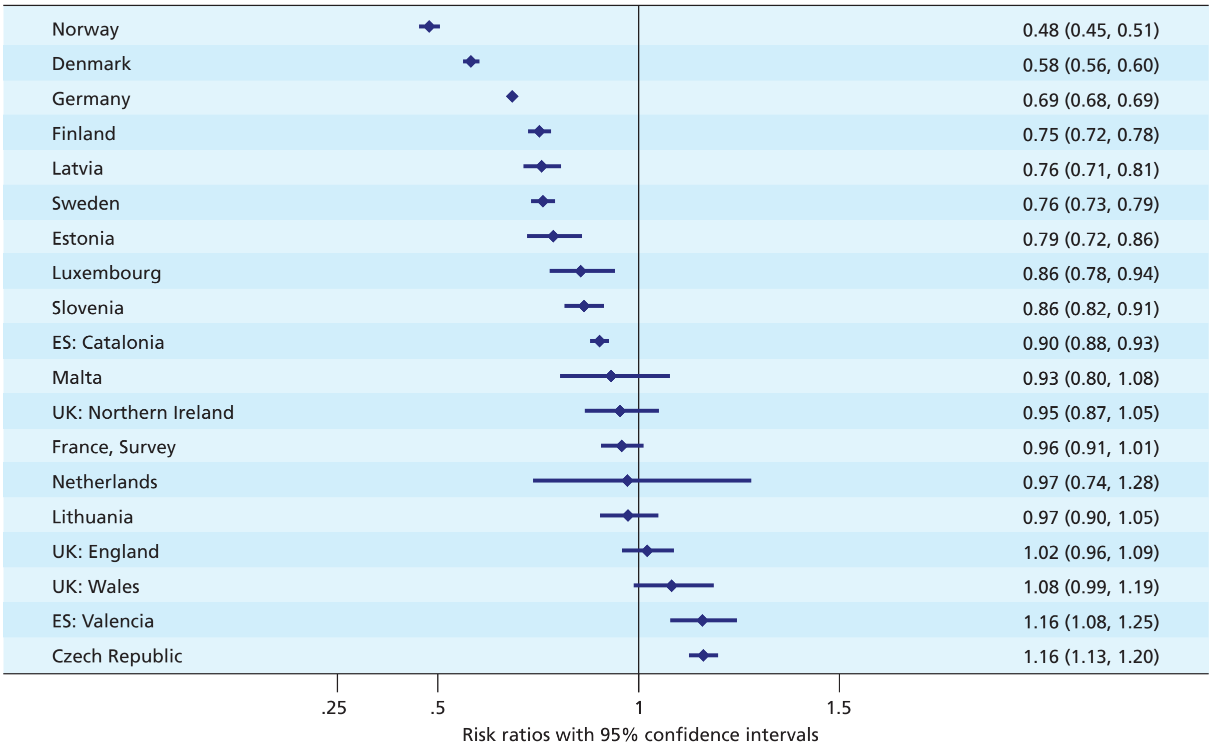
NOTE: *N/A available in 2010, but no longer available in 2015.
** Data for England, Wales and Northern Ireland in 2010 came from the Infant Feeding Survey. This was not done in 2015, so the data source in all three countries has changed.
Second-period data not from 2015: Spain Valencia 2016, France Survey 2016, Croatia 2016, Italy 2013, UK England 2015-2016, UK Wales 2016, Sweden 2014.

Figure R8.1. Smoking during pregnancy in 2010 and and 2015



NOTE: * First trimester or at booking in 2010 and during pregnancy in 2015.
** At booking in 2015, during pregnancy in 2010.
Second-period data not from 2015: Spain Valencia 2016, France Survey 2016, UK England 2015-2016, UK Wales 2016, Sweden 2014.

Figure R8.2. Comparison of smoking during pregnancy, 2010 and 2015 (risk ratios and 95% confidence intervals)



NOTE: Cyprus and Scotland not included because smoking was not recorded at the same period in both years.
Pooled random effects estimate: 0.87 (95% CI: 0.79-0.95).
I^2=99.0% Chi squared tests of heterogeneity: 1852.89 (d.f. = 18), p <0.001.
Second-period data not from 2015: Spain Valencia 2016, France Survey 2016, UK England 2015-2016, UK Wales 2016, Sweden 2014.

R12 DISTRIBUTION OF MATERNAL PREPREGNANCY BODY MASS INDEX

JUSTIFICATION

Promoting a healthy weight before pregnancy is one way to improve maternal and newborn health. Compared to women with normal weight before pregnancy, those who are overweight or obese, as well as those who are underweight, are at higher risk of adverse pregnancy outcomes.

The rising prevalence of overweight and obesity worldwide has important implications for pregnancy and childbirth. Prepregnancy overweight and obesity both increase the risks of pregnancy complications, such as gestational diabetes and preeclampsia. Perinatal and infant outcomes are less favourable, including higher rates of congenital anomalies, in particular, neural tube and congenital heart anomalies, stillbirth, fetal growth restriction, early preterm birth before 32 weeks of gestation, and macrosomia.[1-4] These risks explain in part why overweight and obese women are more likely to deliver by caesarean, but less effective uterine contractions also play a role.[5,6] Overweight and obesity affect maternal outcomes, and these women have higher rates of severe maternal morbidity and maternal death.[2] All these risks increase with the level of obesity. Research also suggests that obesity may affect the longer-term health of the child through fetal programming in utero, changes in the newborn's body composition, epigenetic processes, and changes in the gut microbiome.[7] Potential longer term health and developmental consequences include childhood and adult obesity, the metabolic illnesses associated with obesity, asthma, and neurodevelopmental delay.[4,7]

While much of the current focus of public health policy and practice is on overweight and obesity, being underweight also increases the risks of having a preterm or a low birthweight baby.[8] Both underweight and overweight are associated with lower socioeconomic status and thus create inequalities in health starting at birth.[9]

DEFINITION AND PRESENTATION OF INDICATOR

This indicator is defined as the percentage of women delivering live births or stillbirths by their prepregnancy body mass index (BMI) defined in accordance with WHO guidelines as follows: <18.5 (underweight), 18.5-24.9 (normal), ≥25.0 (overweight and obese).[10] Obese women can be subdivided as obese class I (BMI 30.0-34.9), obese class II (BMI 35.0-39.9), and obese class III (BMI ≥40.0).

DATA SOURCES AND AVAILABILITY OF INDICATOR IN EUROPEAN COUNTRIES

This indicator has limited availability in routine sources in Europe. It was provided by 12 of 31 countries. Poland was able to provide this indicator in 2010, but not in 2015.

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

In most countries for which data are available, prepregnancy BMI is recorded at the first antenatal visit, which may slightly overestimate the mother's BMI before pregnancy. Weights recalled by women themselves, as for instance in France, tend to be slightly under-reported.[11] Some countries had high proportions of missing data for this indicator, with ranges from 0 to 20% or more (Malta, England, and Norway). In general, BMI was missing for around 10% of women.

RESULTS

Figure R12.1 shows that women with a low prepregnancy BMI accounted for 2.4 to 7.4% of mothers giving birth in countries for which data were available, with highs in France (7.4%) and Austria (6.4%) and lows in the UK, Malta, and Sweden (<3.0%). The proportion of overweight or obese women ranged from around 30% to 50% of all women, with prevalence less than 30% in Croatia, Austria and Slovenia and around 50% in the UK. Between 8 and 26% of all women were obese.

In comparison with the 2010 data in the last Euro-Peristat report, the proportions of obese women in 2015 increased slightly in most countries that provided data at both time points, as shown in Figure R12.2. The exceptions are Denmark, where the prevalence was stable, and Norway, where it decreased slightly. In interpreting data from Norway, it should be noted that BMI was recently added and proportions of missing data were high in both 2010 and 2015. Figure R12.3 shows risk ratios with 95% confidence intervals for the change in the prevalence of obesity among pregnant women between 2010 and 2015. The pooled risk ratio was positive and significant – 1.15 (95% confidence intervals: 1.08-1.22) with significant heterogeneity across countries.

KEY POINTS

- Maternal weight before and during pregnancy affects the course of pregnancy, its outcome, and the offspring's lifelong health.
- Despite its importance for describing the risks facing childbearing women, this indicator is not available in most European countries.
- There is a high variation in the distribution of prepregnancy BMI, but in most countries reporting data, more than 10% of women were obese at the onset of pregnancy
- Adding information about women's prepregnancy BMI to routine surveillance systems for maternal and newborn health should be a priority in countries where these data are not available.

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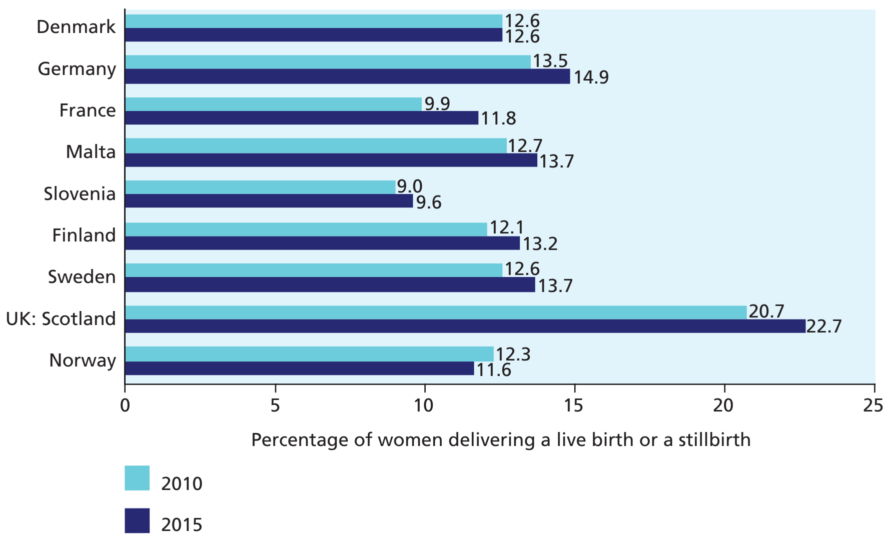
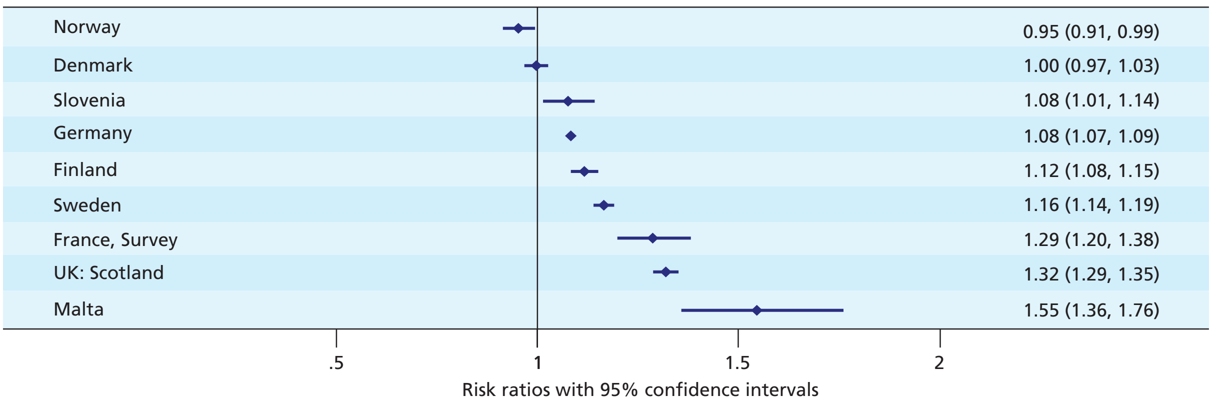
Figure R12.1 Distribution of maternal prepregnancy body mass index

Figure R12.2 Percentages of women with a prepregnancy body mass index ≥ 30 in 2010 and 2015



NOTE: Second-period data not from 2015: France Survey 2016.

Figure R12.3. Comparison of the percentages of women with a prepregnancy body mass index ≥ 30, 2010 and 2015 (risk ratios and 95% confidence intervals)



NOTE: Pooled random effects estimate: 1.15 (95% CI: 1.08-1.22).
I^2=97.7% Chi squared tests of heterogeneity: 352.50 (d.f. = 8), p <0.001.
Second-period data not from 2015: France Survey 2016.

4

MODE OF DELIVERY

4. MODE OF DELIVERY

CORE

Mode of delivery according to parity, plurality, presentation, previous caesarean section, and gestational age (C10)

RECOMMENDED HEALTHCARE INDICATORS NOT INCLUDED IN THIS REPORT

Percentage of all pregnancies following treatment for subfertility (R13)
Distribution of timing of first antenatal visit (R14)
Distribution of births by mode of onset of labour (R15)
Distribution of place of birth by volume of deliveries (R16)
Percentage of very preterm births delivered in units without a neonatal intensive care unit (R17)
Episiotomy rate (R18)
Percentage of births without obstetric intervention (R19)
Percentage of infants breast fed at birth (R20)

The Euro-Peristat indicator list includes one core indicator of health care, which is mode of delivery, as well as eight other recommended indicators, as shown above. Only mode of delivery is included in this report on core indicators.

Pregnancy is not an illness, but a physiological process associated with health risks for some women and babies. When all pregnant women have access to comprehensive antenatal care and deliveries are attended by clinically qualified staff, as is the case in European countries, most women and newborns will not experience complications. A major concern in these and similar countries is to guarantee an adequate level of clinical safety for this group while avoiding over-medicalisation of the pregnancy and, in particular, procedures with side effects.

The development of systematic reviews and the promotion of the concept of evidence-based health care in the field of maternity care began in the late 1980s. The tradition of evaluating clinical practices and working to find a balance between insufficient or excessive intervention might have been expected to lead to similarities between the patterns of maternity care. In Europe, however, Euro-Peristat and many other European projects have documented wide diversity in approaches to providing care during pregnancy, childbirth, and the postpartum period. Mode of delivery provides a clear-cut example of these differences. By collecting this indicator by subgroups defined by their levels of risk, as recommended by Euro-Peristat, it is possible to show that differences in the childbearing population are not major drivers of these differences.

C10 MODE OF DELIVERY

JUSTIFICATION

Caesarean delivery can be a lifesaving procedure for both mother and child. Ability to provide access to timely caesarean delivery in emergency situations is a key quality indicator for maternity care services.[1] However, in the absence of maternal and fetal complications, vaginal delivery is associated with less maternal morbidity and is at least as safe as caesarean delivery for the newborn.[2,3] It is also the preferred option for a very substantial majority of pregnant women. Furthermore, caesarean delivery increases the risks of some pregnancy complications in subsequent pregnancies, including placenta accreta, placenta praevia, placental abruption, and stillbirth.[4] There is also a growing body of research showing that caesarean delivery is associated with elevated risks of asthma and obesity for the child.[4] The large rise in the caesarean rate since the 1970s is therefore a long-standing and continuing cause for concern.[5-7]

In 1985, a World Health Organization conference concluded that the caesarean delivery rate should be no more than 10-15%.[8] Recently, WHO updated this statement to recommend that "Every effort should be made to provide caesarean sections to women in need, rather than striving to achieve a specific rate." Nonetheless, after a review of the literature on country-level associations between caesarean rates and perinatal mortality, the WHO expert group continued to support the previous statement that increases in the caesarean delivery rate over the threshold of 9-16% do not appear to be related to better population health outcomes.[9] However, they also conclude that further research on perinatal morbidity is needed.

Caesarean rates vary widely in participating countries, from 15% to over 40%.[10] Countries also vary in their use of operative vaginal delivery, either with forceps or vacuum extraction.[10] The common objective of these other interventions is to facilitate labour with the aim of ensuring a natural delivery with mother and newborn in good health. However, while we might expect to find a trade-off between instrumental delivery and caesarean delivery, a Euro-Peristat analysis using data from 2010 did not find that countries with higher rates of instrumental deliveries had lower caesarean delivery rates.[10]

Variations in obstetric intervention rates are affected by the distribution of demographic and clinical characteristics among childbearing women, such as parity, older maternal age, multiple births, fetal presentation, and maternal obesity. They are also related to the health system and specific related factors, such as fear of litigation, financial incentives when payments are higher for caesarean delivery, women's requests for caesarean delivery, and differences in clinical assessments of risks associated with continued pregnancy for some pregnancy complications.[11-14]

To monitor practices for all countries, Euro-Peristat collects data not only for all deliveries, but also by subgroups defined by levels of risk. These subgroups make it possible to standardise comparisons between countries and to gain knowledge about practices in specific situations. For instance, it is useful to compare caesarean delivery rates among primiparous women because operative delivery, especially by caesarean section, increases the risk of operative delivery in subsequent pregnancies. Moreover, the complication rates of primiparous women are higher than those of women who have already given birth (see C9 on parity). Furthermore, there are on-going debates about the need for systematic caesarean delivery for breech presentations, multiple births, and women with a previous caesarean birth, and it is useful to highlight differences in practices by comparing rates of caesarean delivery among these subgroups.

Investigation by subgroup also helps to explain variations in the overall caesarean rate. The Robson 10-group classification, which takes these subgroups into consideration, has been recommended by WHO for the evaluation of caesarean rates at the hospital level.[15,16] The Euro-Peristat project collected data according to the Robson classification for the first time in 2015; these data are in the process of validation and will be published at a later date.

DEFINITION AND PRESENTATION OF INDICATOR

This indicator is defined as the percentage distribution of all births, live born and stillborn, by method of delivery for all women and then subdivided by parity, previous caesarean delivery, presentation, and plurality. Data were also requested for caesarean sections as a percentage of births at grouped weeks of gestational age.

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

Countries differ in the ways that they classify caesarean deliveries. Some countries subdivide them according to whether they took place before or during labour. Others use the subdivision into elective caesarean sections, which include all those planned before the onset of labour and thus include a few that take place after labour has started, and emergency or unplanned caesareans. Sometimes, emergency caesarean sections may include those performed before the onset of labour in response to a clinical emergency. Rates in the Czech Republic, Portugal, Spain, and England were reported per woman. This may result in slight underestimates of operative deliveries, as multiple births to one woman are counted only once.

DATA SOURCES AND AVAILABILITY OF INDICATOR

Method of delivery was available everywhere except Greece. Data about whether caesarean sections took place before labour or were elective were not available for Bulgaria, Ireland, Poland, Portugal, or Hungary. In Spain, national data cover all public hospitals but only around 60% of private hospitals. In Portugal, only the total caesarean rate was available from all hospitals. More detailed data were provided from public hospitals and used to describe caesarean rates by subgroup. No data were available on instrumental deliveries in Bulgaria, Poland, or Portugal. In France, we used the 2016 National Perinatal Survey, which includes all births over a one-week period and collects detailed information on caesareans. This data source was used for Euro-Peristat in 2010 and the comparison over periods is based on the survey data. These data are similar to those from hospital discharge data for France as a whole, provided in Appendix B.

RESULTS

As shown in Figure C10.1, caesarean delivery rates varied widely throughout Europe, with a median of 27.0% and an IQR of 21.2% to 32.7%. Rates were 56.9% in Cyprus and above 40% in Bulgaria, Poland, and Romania. The median vaginal instrumental delivery rate was 7.2%, also with wide variation between countries: 15% or more in Spain, and Ireland versus below 3% in Romania, Lithuania, Croatia, Slovakia, Slovenia, Latvia, and the Czech Republic. Data from 2015 showed that, as in 2010, instrumental delivery rates were not correlated with caesarean delivery rates.

Figure C10.2 shows caesareans subdivided into those initiated before labour (or planned) and those during labour (emergency). Prelabour caesarean delivery rates ranged from 3.6% to 40.5%, with a median of 11.3% for all of the countries that can provide this breakdown. For caesareans during labour, these figures are 8.7% to 43.3% with a median of 12.9%. Unfortunately, some countries with high caesarean rates, including Bulgaria, Hungary, and Poland, are not able to provide this information.

Figure C10.3 maps overall caesarean delivery rates in Europe by dividing countries into six groups. This map shows that these rates are higher in the southeastern countries of Europe, with some exceptions. There is also a cluster of countries with low rates in the Nordic and Baltic regions.

CHANGES FROM 2010 TO 2015

Countries experienced heterogeneous rate changes between 2010 and 2015, as shown in Figure C10.4, which presents the 2010 rates and their differences in 2015. The differences between these two periods do not seem to be related to the rates in 2010, as there were both increases and decreases in countries with high as well as low caesarean rates. Figure C10.5 displays these changes as relative risks and provides information on the confidence intervals around these estimates. Decreases range from 2 to 13% of 2010 rates, with the largest decreases observed for Lithuania, Latvia, Portugal, Estonia, and Italy. Countries with substantial increases include Hungary, Poland, and Romania, where caesarean delivery rates are among the highest in Europe. Caesarean rates also rose in Ireland and Scotland. The pooled measure of change across all the countries in Europe is 1.04 (95% confidence interval: 1.00-1.08), reflecting the larger number of countries with increased rates; however, the heterogeneity in changes is highly significant.

CAESAREAN SECTION BY RISK GROUP

Table 10.1 displays overall caesarean rates by parity (primiparous, multiparous), previous caesarean section (no, yes), multiplicity (singleton, multiple), and presentation (vertex, breech). For each group, the table reports the number of countries that can provide these data as well as their median, IQR, and minimum and maximum rates. The variation in each group is as wide as for the overall caesarean delivery rate. However, some of the countries with the highest caesarean rates, including Hungary, Bulgaria, Poland, and Romania, cannot provide data in these subgroups. For women giving birth for the first time, the median was 27.4% with an IQR of 22.2%-33.2% and a minimum and maximum of 18.3% and 57.1%. For women with a previous caesarean, the median was 73.9% (range: 44.6%-95.3%), with multiple pregnancies, 63.1% (range: 43.5%-98.5%), and with breech presentations, 89.4% (range: 64.3%-100%). In general, countries had similar practice patterns tending towards lower or higher rates across all subgroups.

KEY POINTS

- Mode of delivery differs markedly throughout Europe, with lower levels of caesarean births around 16% to 17% in most Nordic countries and the Netherlands, and higher caesarean rates in Cyprus, Romania, Bulgaria, Poland, and Hungary, around 40% or higher. Other countries with higher than average caesarean rates – around 35% – are Italy and Switzerland.
- Use of instrumental delivery also varies widely and is not related to use of caesarean delivery.
- Marked differences are also observed in key subgroups; in some countries, for example, almost all deliveries for women with a fetus in a breech presentation are by caesarean, whereas elsewhere vaginal delivery is considered in these situations.
- Some countries with high caesarean delivery rates cannot produce data by these subgroups. As this information improves capacity to evaluate care and to compare practices across units and internationally, health information systems in these countries should be broadened to include these items.
- These differences in obstetric interventions across Europe raise questions about their impact on short-term, but also longer-term, maternal and child health. They also underscore the differences in approaches that the countries of Europe have taken to limiting obstetric interventions.

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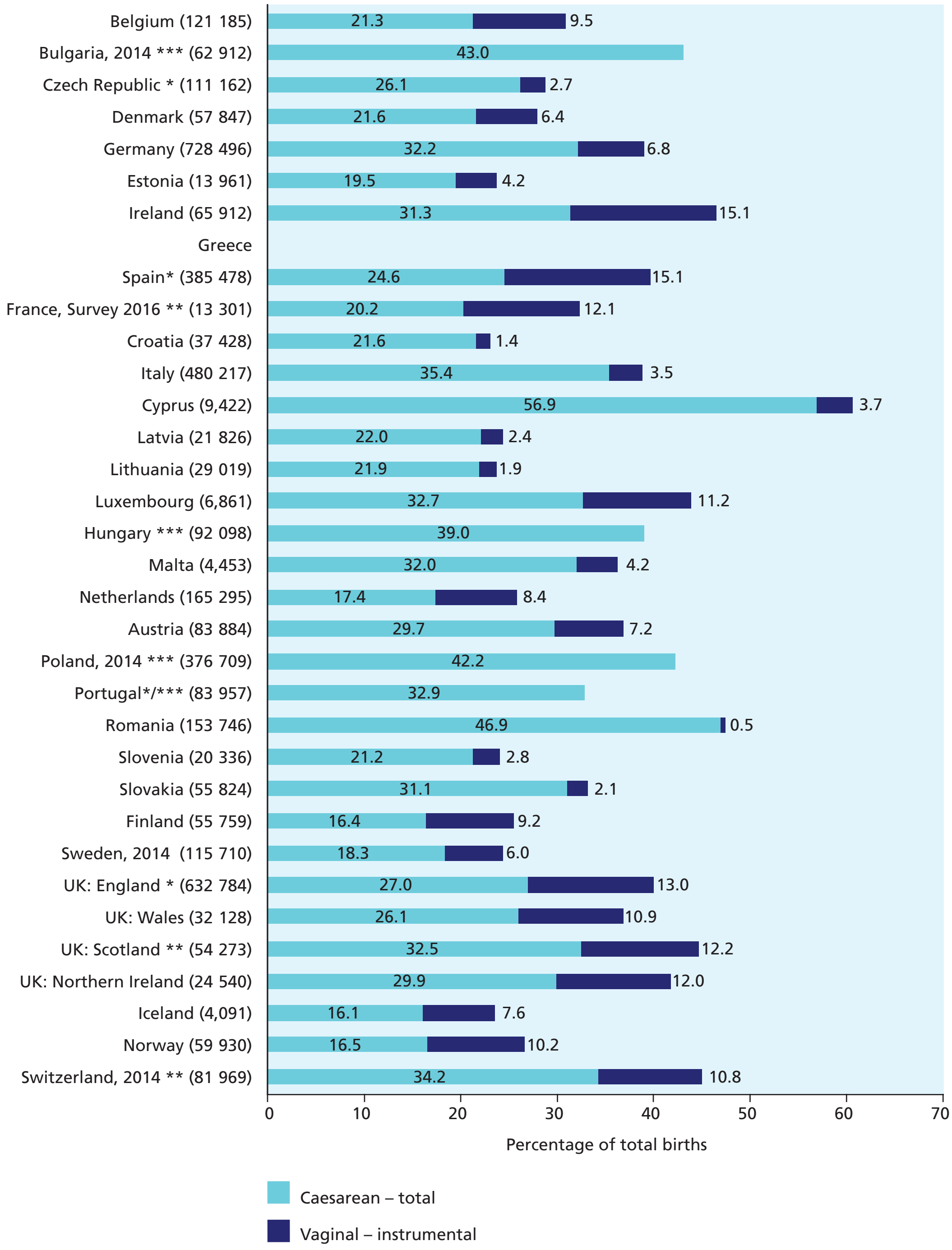
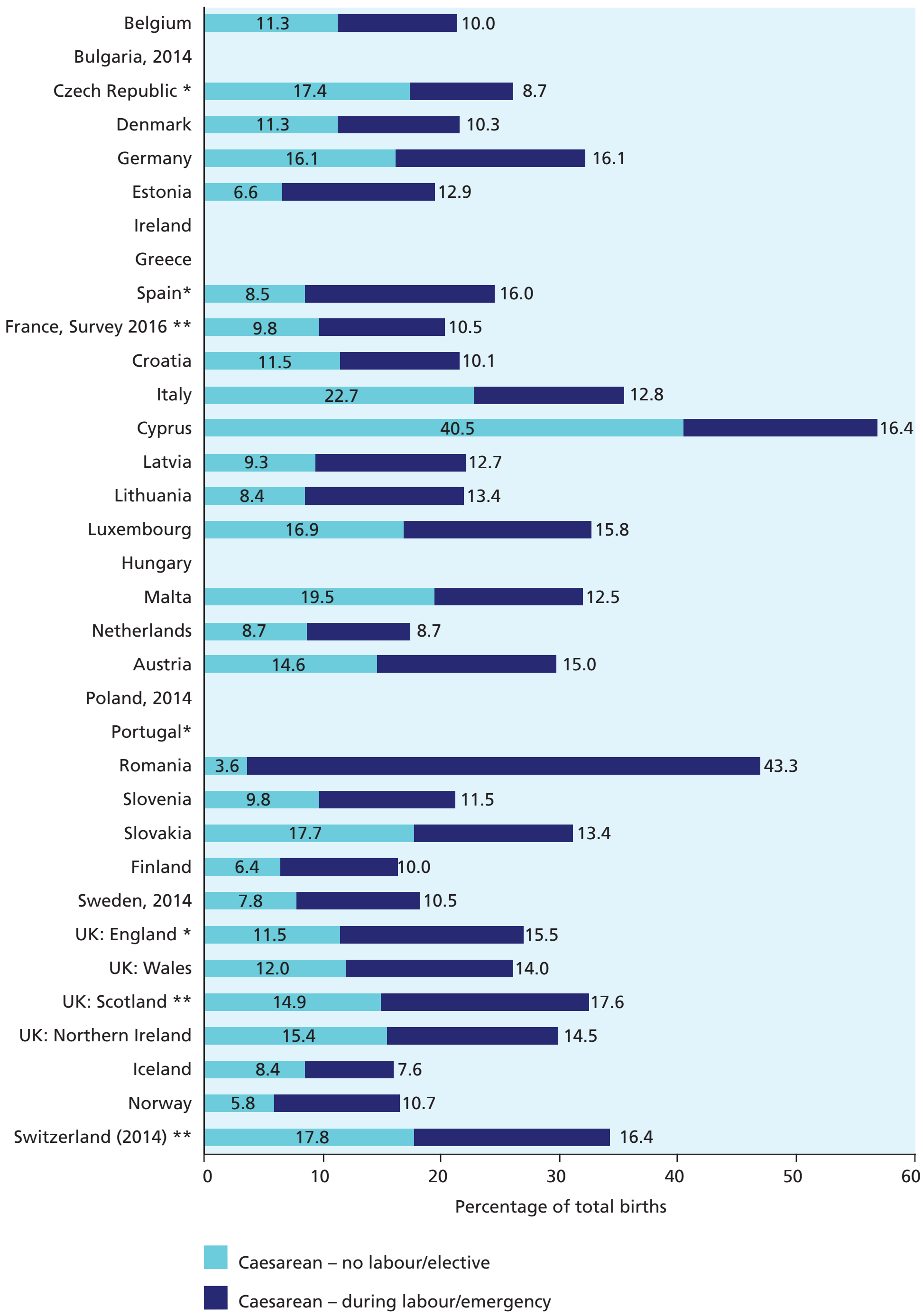
Figure C10.1 Percentages of births by mode of delivery in 2015



Note: *In the Czech Republic, Spain, Portugal, and England, N corresponds to the number of mothers instead of babies.
** Missing information: in Switzerland, 185 caesareans with unknown mode of onset are excluded and 3 in France (survey); in Scotland, 181 vaginal deliveries with an unknown mode of delivery (instrumental or not) are excluded.
*** Bulgaria, Hungary, Portugal, and Poland do not have data on vaginal instrumental deliveries.

Figure C10.2 Percentages of births by type of caesarean delivery in 2015



Note: *In the Czech Republic, Spain, and England, N corresponds to the number of mothers instead of babies. ** Missing information: in Switzerland, 185 caesarean sections with unknown mode of onset are excluded, and 3 in France (survey); in Scotland, 181 vaginal deliveries with unknown mode of delivery (instrumental or not) are excluded.

Figure C10.3 Caesareans as a percentage of all births in 2015

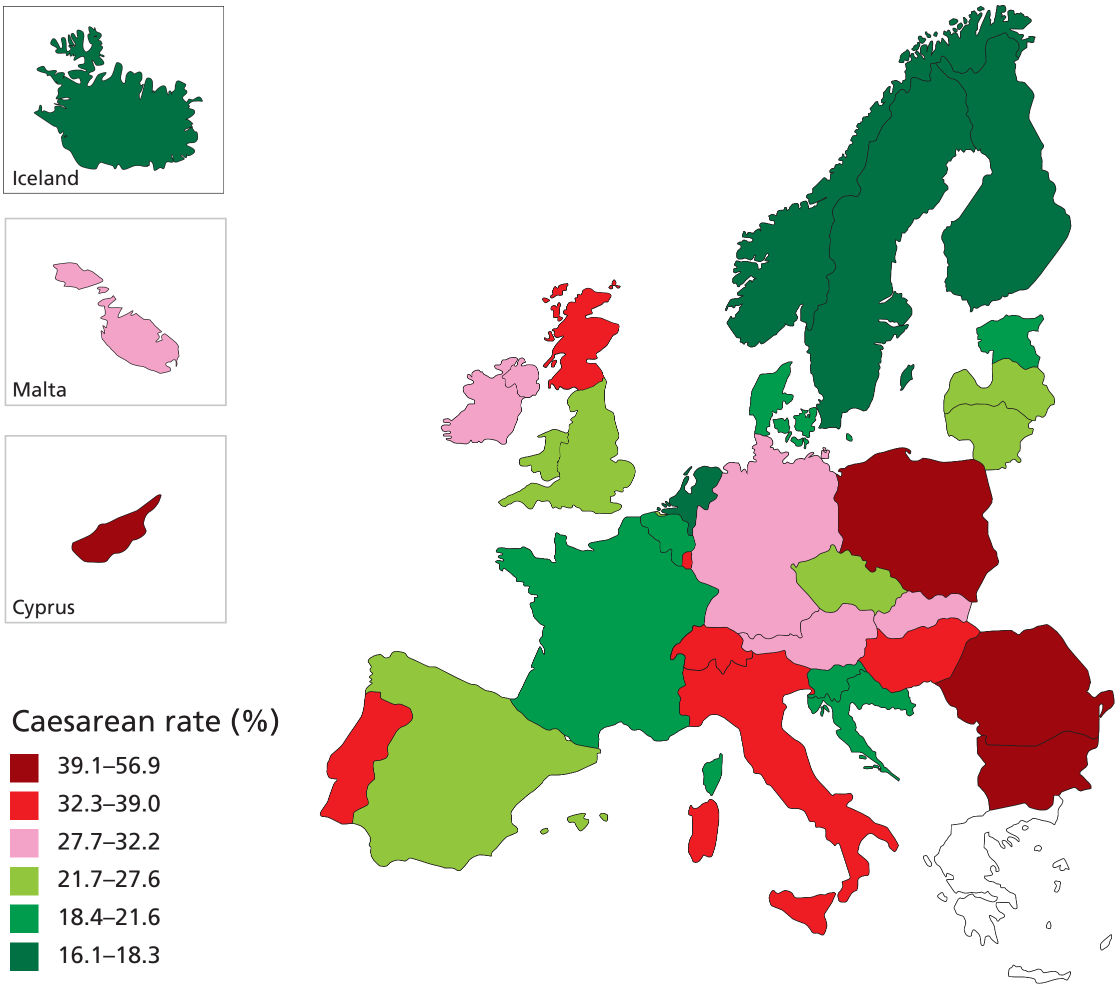
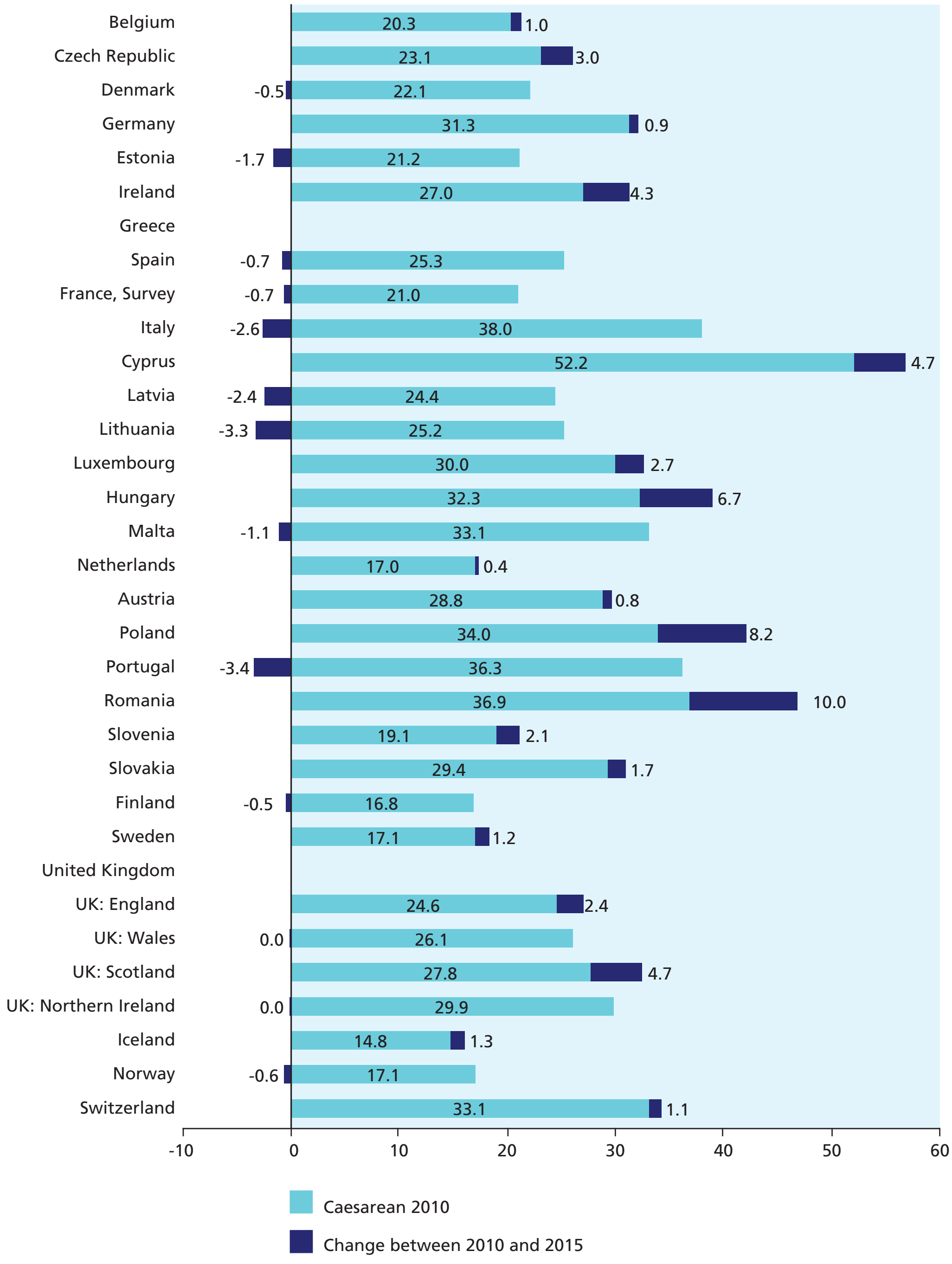
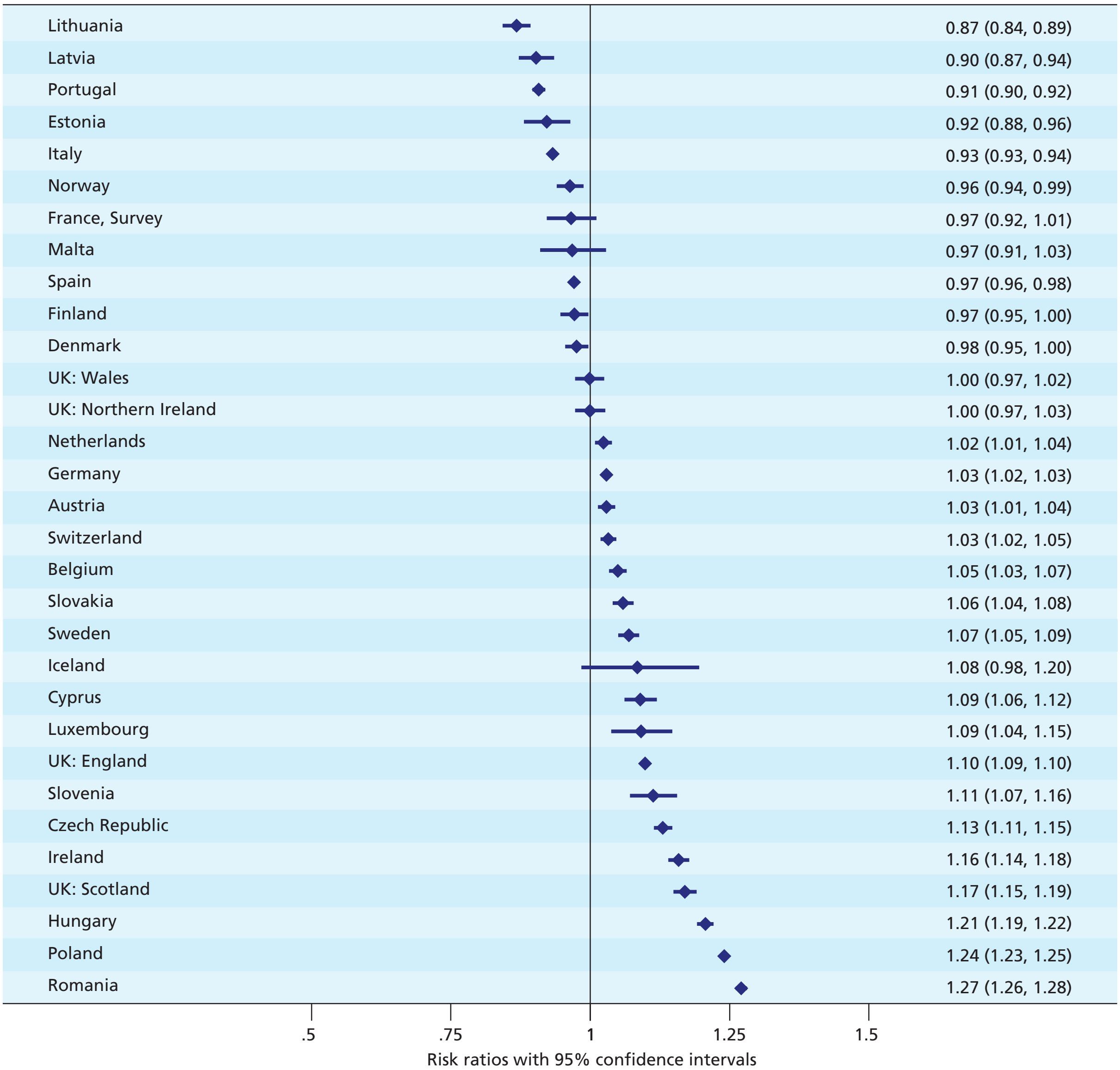


Figure C10.4 Percentages of births by caesarean delivery in 2010 and differences with 2015



NOTE: First-period data not from 2010: Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Poland 2014, Sweden 2014, Switzerland 2014.

Figure C10.5 Comparison of caesarean delivery rates, 2010 and 2015 (risk ratios and 95% confidence intervals)



NOTE: Pooled random effects estimate: 1.04 (95% CI: 1.00-1.08).
I^2=99.7% Chi squared tests of heterogeneity: 9483.02 (d.f. = 30), p <0.001.
First-period data not from 2010: Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Poland 2014, Sweden 2014, Switzerland 2014.

Table C10.1 Caesarean delivery rates by risk subgroup

		Total births*	Percentage of total births							
			Caesarean section rates by subgroup							
Country/ coverage	Data Source		Primiparous	Multiparous	No previous caesarean	Previous caesarean	Singleton pregnancy	Multiple pregnancy	Vertex	Breech
Belgium	1	121 185	22.5	20.5	15.6	68.4	20.0	58.5	17.0	89.7
Bulgaria										
Czech Republic	2	107 618	28.0	24.4	20.6	74.9	25.3	80.4	NA	96.9
Denmark	1	57 847	22.2	21.1	18.9	66.8	20.2	63.1	18.3	88.6
Germany	1	728 496	34.5	30.1	26.5	71.5	30.5	75.2	NA	NA
Estonia	1	13 961	21.3	18.2	14.6	61.7	18.0	62.7	17.0	89.4
Ireland	1	65 912	33.2	30.1	NA	NA	29.9	66.8	NA	NA
Greece										
Spain	1	385 478	30.4	22.7	NA	NA	24.8	67.8	NA	NA
France, Survey 2016	1	13 301	23.2	18.0	15.3	59.1	19.0	54.3	16.9	74.8
Croatia	1	37 428	24.5	18.7	17.0	68.5	20.3	59.0	NA	NA
Italy	9	480 217	35.5	35.4	26.1	88.6	33.7	87.5	32.2	96.3
Cyprus	1	9422	57.1	56.6	45.7	95.3	54.8	93.2	54.8	96.2
Latvia	1	21 826	22.2	21.9	14.4	87.7	20.9	58.0	19.6	73.2
Lithuania	1.2	29 019	22.5	21.2	15.5	76.4	20.8	57.4	19.7	84.5
Luxembourg	1	6861	35.1	30.4	5.4	78.0	30.8	82.7	28.2	96.0
Hungary										
Malta	1	4453	30.9	33.2	23.7	78.1	29.9	98.5	29.3	98.2
Netherlands	1	165 295	19.2	16.0	13.5	61.9	16.6	43.5	14.2	78.8
Austria	1	83 884	31.2	28.3	NA	NA	28.1	79.8	25.8	93.6
Poland										
Portugal**	2	86 048	NA	NA	22.1	68.4	26.9	64.0	23.8	93.0
Romania										
Slovenia	1	20 336	22.8	19.7	16.7	78.7	19.6	60.7	17.6	86.9
Slovakia	1	55 824	32.9	29.1	22.6	80.8	29.8	78.5	NA	NA
Finland	1	55 759	20.8	13.2	12.9	44.6	15.4	49.5	14.0	64.3
Sweden	1	115 710	20.4	16.7	10.2	69.3	17.1	59.0	15.4	88.6
United Kingdom										
UK: England	2	632 784	28.1	26.6	24.2	72.8	26.4	69.4	23.5	88.0
UK: Wales	1	32 128	27.4	25.5	21.2	77.4	25.0	63.1	23.8	87.5
UK: Scotland	1	54 273	33.3	31.9	25.0	83.9	31.2	77.4	24.3	100.0
UK: Northern Ireland	1	24 540	30.3	29.6	19.6	78.4	28.6	70.6	26.2	89.6
Iceland	1	4091	18.3	15.8	10.6	65.0	15.8	44.2	13.8	86.2
Norway	1	59 930	18.6	14.9	12.6	52.4	15.5	46.4	13.7	65.5
Switzerland	1,2,3	81 969	35.6	33.0	28.3	88.2	32.4	81.1	28.5	95.5
N or countries			28	28	26	26	29	29	23	24
Median			27.7	23.6	19.3	73.9	25	64	19.7	89
[IQR]			[22.2-33.1]	[18.5-30.1]	[14.6-24.2]	[66.8-78.7]	[19.6-29.9]	[58.5-78.5]	[16.9-26.2]	[85.4-95.8]
Min/Max			18.3/57.1	13.2/56.6	10.2/45.7	44.6/95.3	15.4/54.8	43.5/98.5	13.7/54.8	64.3/100

Note: *Number of total births with at least some data on mode of delivery, but denominators change for each subgroup.
** Data from public hospitals only.

5

MOTHERS' MORTALITY ASSOCIATED WITH CHILDBEARING

5. MOTHERS' MORTALITY ASSOCIATED WITH CHILDBEARING

CORE

Maternal mortality ratio (C6)

RECOMMENDED INDICATORS OF MORBIDITY NOT INCLUDED IN THIS REPORT

Maternal mortality by cause of death (R5)
Incidence of severe maternal morbidity (R6)
Incidence of tears to the perineum (R7)

Adverse maternal outcomes in pregnancy include mortality, near misses, severe morbidity, long-term sequelae, and minor morbidity. Each year more than 5 million women give birth in the EU. Another 2 million have a pregnancy that does not end in birth: spontaneous and induced abortions and both molar and ectopic pregnancies.

Maternal death is a major human tragedy; it is also, even in high-income countries, a key marker of health system performance. The global number of women who die in Europe during and because of pregnancy or childbirth ranges from 335 to 1000 according to the estimation method used. Such a range of variation is surprising for countries that all have quality birth registration systems; the discrepancies in national rates will be discussed later in the chapter.

Maternal mortality results from severe obstetric complications and conditions which mostly do not lead to death. This maternal morbidity is not adequately measured, however, because there is no international agreement about the definition of the conditions and also because the recording of these conditions is not standardised in routine hospital discharge databases, the main source of these data. Euro-Peristat contributes to on-going work to harmonise definitions for maternal morbidity to make it possible to measure it comparably in all countries. Risks of adverse maternal health outcomes rise with maternal age, BMI, and multiple pregnancy; all of these are becoming more common in the population of childbearing women in many countries.

In this core report, only the MMR (C6) is presented, including maternal deaths by age, and information about enhanced or routine maternal mortality data collection systems. The other three recommended indicators are: the causes of maternal death (R5), severe maternal morbidity, based on a working definition using ICD10 diagnostic codes, and perineal tears (R7), that is, third- and fourth-degree lacerations, which are associated with substantial morbidity and considered to reflect, in part, the quality of care.

C6 MATERNAL MORTALITY RATIO

JUSTIFICATION

Maternal mortality in Europe has decreased to a very low level, but healthy young women are still 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 this probability is low, maternal deaths in Europe are sentinel events that raise questions about the administration of effective care and the avoidance of substandard care.[1] They are also more frequent among disadvantaged and migrant women[2,3] and thus a marker of social inequalities in maternal health and of inequities of the healthcare system.

All countries participating in Euro-Peristat produce routine statistics from national civil registration and cause-of-death data systems on the frequency of maternal deaths. These have, however, been shown to be incomplete. Enhanced systems for reporting maternal deaths are necessary because all studies show that routine systems have a twofold problem: they underestimate the total numbers of maternal deaths by an order of magnitude of 25 to 70%, and they misallocate causes. Accurate information about both numbers is a prerequisite for robust public health recommendations.[4-6] Only a few European countries use enhanced systems, including formal systems of "Confidential Enquiry" or in the current WHO terminology, "Maternal Death Surveillance and Response".[7] These systems have especially strong traditions in France, the Netherlands, and the United Kingdom.

The most effective enhanced systems implement routine data linkage, in particular, linkage of deaths of women of reproductive age with births in the previous year, completed with direct information from the registrar about all cases not reported. The persistent lack of completeness for deaths during pregnancy, especially early pregnancy, implies that completeness requires multiple information channels, as used in the enhanced systems in France, Italy, the Netherlands, and the UK. Because of their multiple data linkage and miscarriage and abortion registries, it is reasonable to believe that the Nordic systems also provides a reliable rate.[8] Because of the importance of the data source in determining maternal mortality, Euro-Peristat requests information not only from routine systems but also from confidential enquiries and other enhanced systems where they exist.

Beyond improving statistics on maternal death, enhanced systems are used to study the circumstances that surround maternal mortality and the chain of events leading up to each death; these findings contribute to the prevention of future deaths. These investigations serve as a powerful tool for identifying weaknesses in the provision of care and recommending improvements to health policy makers, as in the recent UK recommendations for general practitioners.[9]

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, regardless 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.[10] Because the number of deaths each year is so low in most countries, we used data covering a five-year period (2011 to 2015). Providers were asked for "routine" as well as "enhanced" data when these exist.

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 countries provided data from routine systems, with the exception of the Czech Republic and the Netherlands, which provided only data from enhanced system. Estonia, Ireland, France, Italy, and the United Kingdom provided data from systems with enhanced data collection as well as data from routine systems. Not all countries provided data for the years requested, ie, the five years between 2011 and 2015. Eight countries provided routine data for another period (6 of them from 2010-2014), and three used different time frames for data from enhanced systems.

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

The first major difficulty in reporting maternal mortality is that maternal deaths remain generally under-reported,[11] so much so that WHO continues to consider that official routine statistics from high-income countries need to be weighted systematically by a factor of 1.5.[12] Because the WHO coefficient assumes the same level of under-reporting everywhere, we do not apply it. Instead, we provide data from enhanced systems 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 enquiries 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. The same applies to the French confidential enquiry. Nonetheless, Euro-Peristat's previous research suggests that countries that establish enhanced systems for ascertaining maternal deaths may have less under-reporting of maternal deaths in routine data as well.[4]

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, MMRs were calculated with data for the 5 years 2011-2015 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, no deaths were registered for the 2011-2015 period in Malta. Countries such as Iceland, Luxembourg, and Malta, all with fewer than 10 000 births per year, would need to collect maternal deaths over half a century or more to provide data as robust as those of the French or UK confidential enquiries. This would not be meaningful, because of the social and medical change that occur over such periods.

The last two difficulties pertain to possible non-inclusion and misclassification issues: unclear limits between indirect and direct deaths, and even between coincidental and maternal deaths, as in the case of suicide,[13,14] as well as possible prolonged resuscitation or suicide beyond 42 days, which would transform a maternal death into a late maternal death, not collected by Euro-Peristat.

RESULTS

The total number of maternal deaths officially recorded in routine systems over a five-year period varied from none in Malta, fewer than 5 in Cyprus, Estonia, Luxembourg, and Iceland to over 200 in France and the United Kingdom, as shown in Figure C6.1. The rates for the Czech Republic and the Netherlands in this graph are from enhanced systems as routine data were not provided.

Rates from enhanced systems, compared with rates from routine systems, are provided in Figure C6.2.

Based on data in routine systems, rates above 12 per 100 000 live births are reported by Hungary, Romania, and Latvia. Most countries report rates between 5 and 11.9 per 100 000 births, while Belgium, Germany, Greece, Poland, Spain, Slovakia, Switzerland, and the Nordic countries report rates below 5 per 100 000. The Nordic countries have a strong social and health support system and a managed migratory influx, so that their very low rates may reflect the true situation.[15] In other countries, exceptionally low rates may be related to ineffective ascertainment, especially in countries with a high rate of migrant mothers, specifically Belgium, Germany, Greece, and Spain.

Seven countries provided data from enhanced systems; five of them also provided routine system data (Figure C6.2). In all of these cases, maternal mortality calculated with data from enhanced systems was higher than that with data from routine systems, with Estonia's MMR rising from 4.3 to 12.9, France's from 6.4 to 8.9, and Italy's from 3.6 to 9.7. These examples show the extent to which MMR can be under-reported in routine reporting. Italy provides food for thought in this area: in the previous Euro-Peristat report, its rate was 2.1 per 100 000, and it is 3.1 per 100 000 using routine data in 2015. However, an enhanced system based on record linkage with hospital discharge records and birth certificates made it possible to improve ascertainment and shows that the true ratios are more than double those in routine systems.[16] The difference between routine and enhanced systems reflects the characteristics of these systems since some are more comprehensive in their methods for enhancing ascertainment. In the Czech Republic, for instance, because enhanced collection involves case identification through regular contact with all the maternity hospitals, it does not improve ascertainment of non-hospital deaths. These data are nonetheless considered of higher quality than routine data, which were considered too incomplete to be submitted for this report.

Changes over time between our last Euro-Peristat report covering data from 2006-2010 are heterogeneous and confidence intervals overlap in many countries. Changes over time may also reflect differences in ascertainment of maternal deaths between the periods. Reassuringly, there have been declines in several of the countries performing confidential enquiries, where data are more reliable: France from 9.1 to 8.9, the Netherlands from 7.7 to 5.1, and the UK from 11.4 to 8.5. This result is especially encouraging as maternal mortality has risen in the USA recently,[17] where debate continues about whether this increase is an artefact due to better ascertainment or a real effect associated with an increase in risk factors either in the childbearing population or related to the healthcare system.

Figure C6.4 presents MMRs by maternal age group. In view of the small numbers, we pooled the data from contributing countries and focused on three age groups: younger than 25 years, 25-34 years, and 35 years and older. 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 for the other age groups. Compared with results from the previous Euro-Peristat reports, however, this differential has declined. In the last French report on maternal deaths, the group at lowest risk was no longer women aged 20-24, but those 25-29.[18]

KEY POINTS

- The MMR is low (less than 10 per 100 000) in most European countries, but we believe it is often underestimated. 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.
- There is no agreement on the components of an "enhanced system", which may provide false reassurance about the completeness of ascertainment. Maternal death surveillance and response systems (record linkage, confidential enquiries, and targeted recommendations) are of paramount importance to obtain complete data on maternal deaths, as well as to make it possible to understand how these deaths happened and make recommendations to prevent the recurrence of those that were preventable.
- These systems exist in some European countries and are sometimes in place also for perinatal deaths and/or severe maternal morbidity. The generalisation of these systems is desirable as they make it possible to measure the true burden of maternal death and can thus inform policies to improve care.

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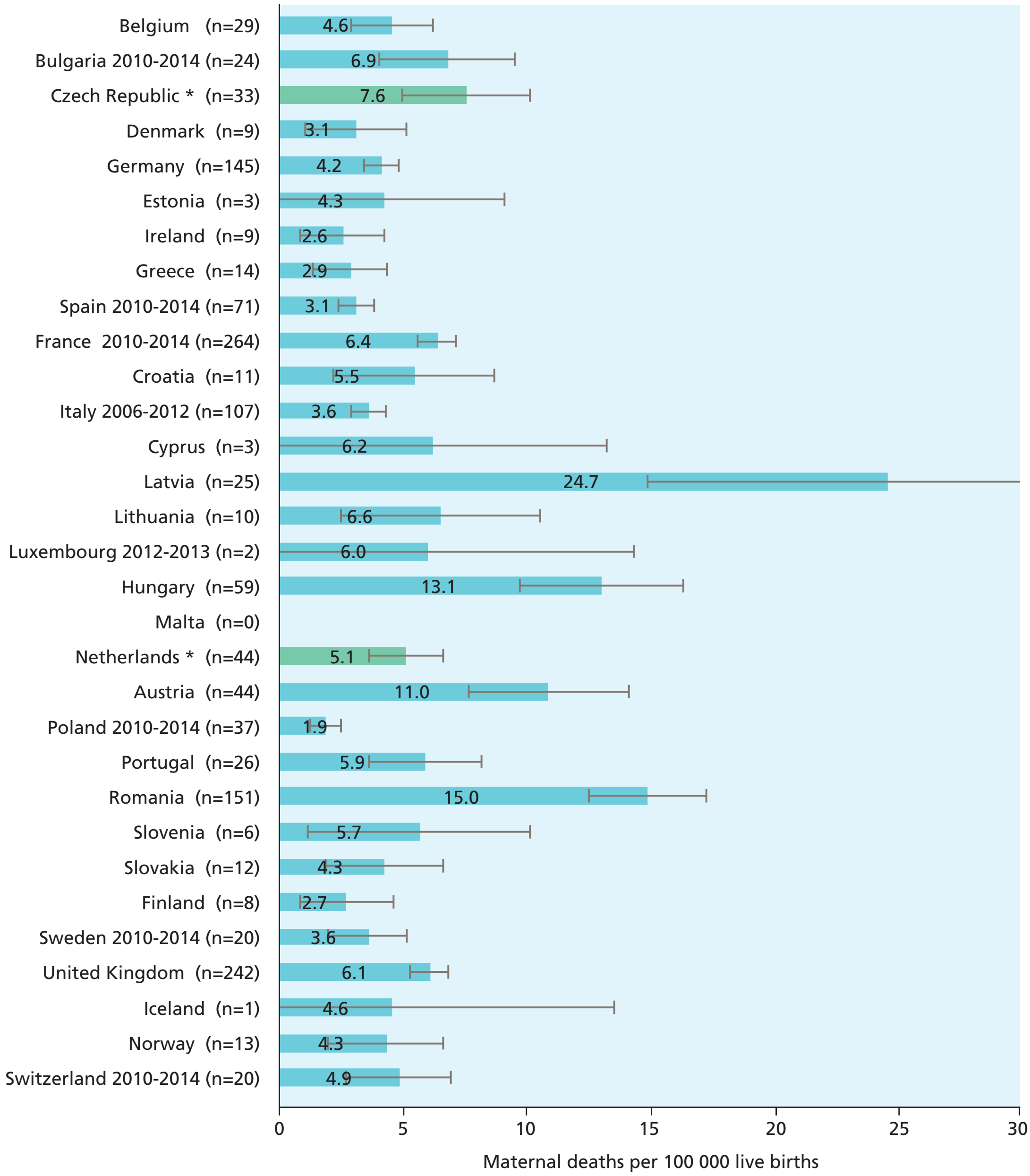
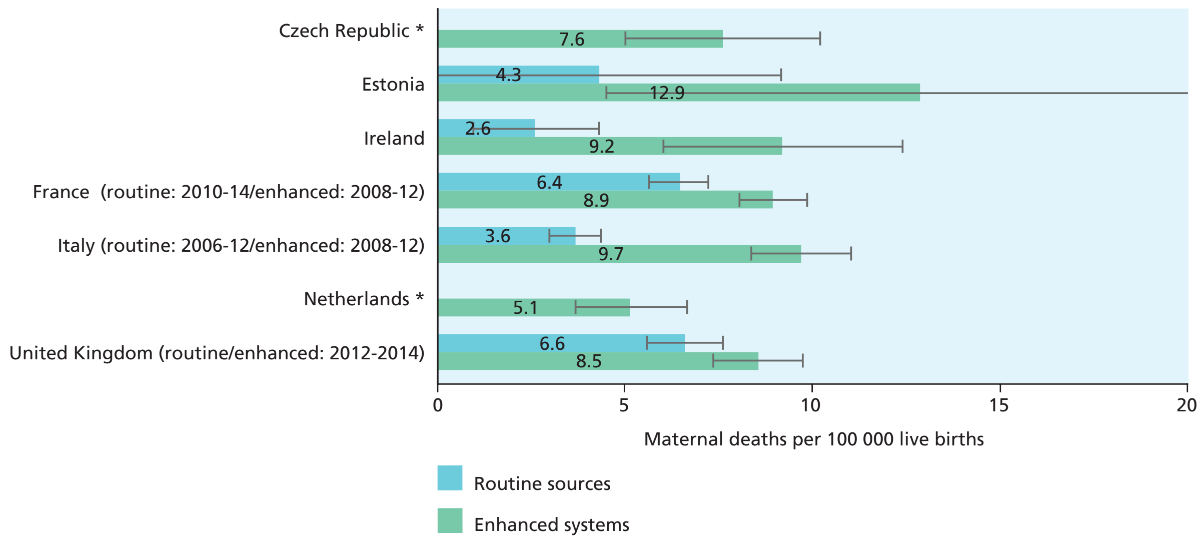
Figure C6.1. **Maternal mortality ratios with 95% confidence intervals, 2011-2015 (except where noted)**



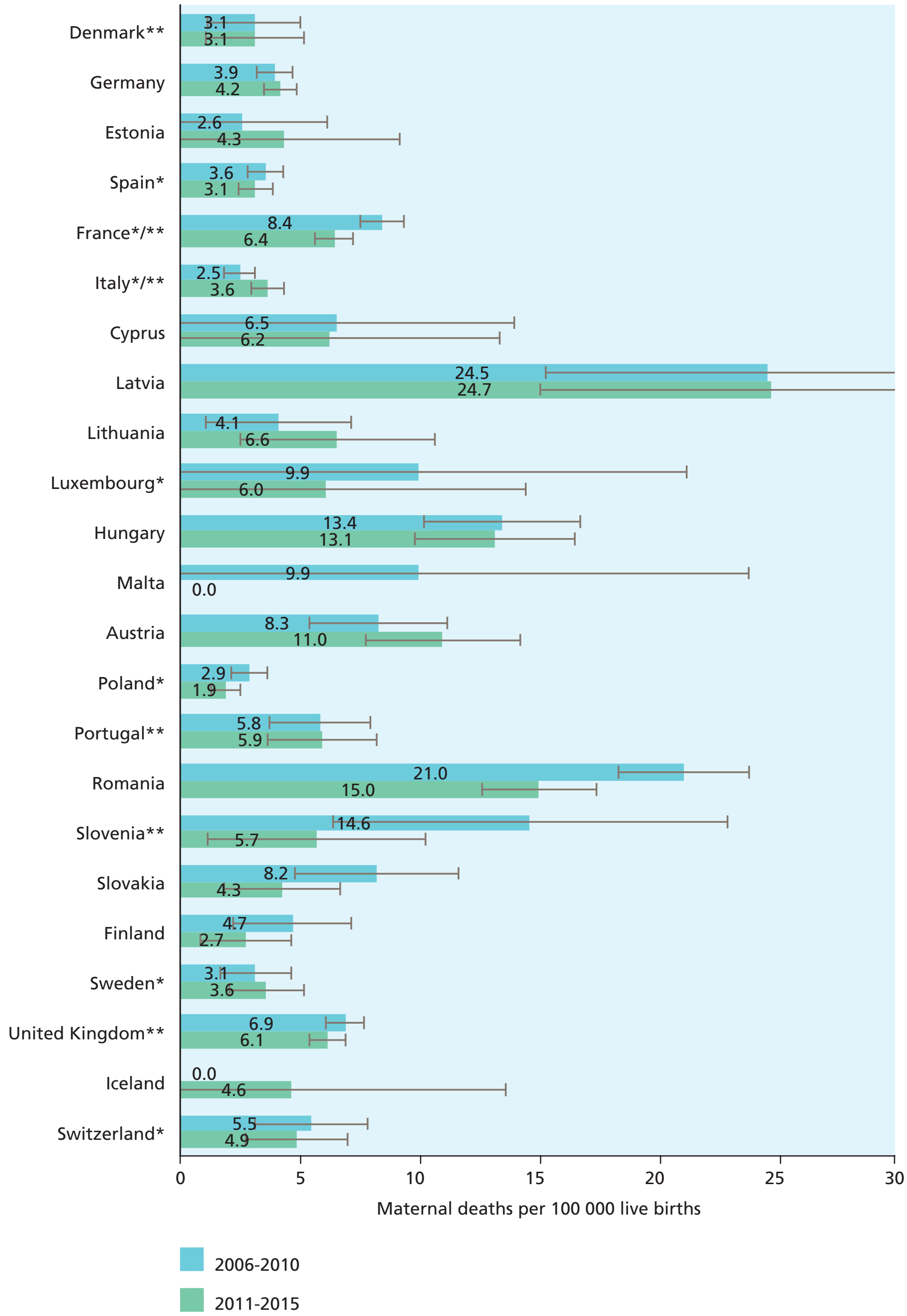
NOTE: Number of deaths in parentheses. *Data from enhanced system, routine system data not provided.

Figure C6.2 Maternal mortality ratios from routine statistics and from enhanced systems, 2011-2015 (except where noted)



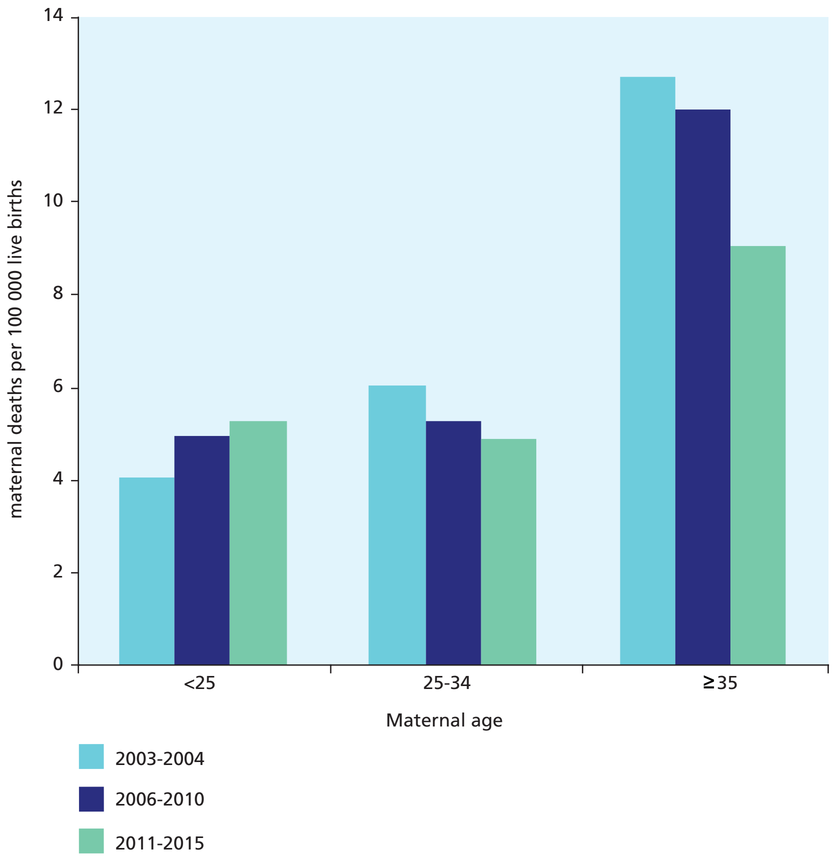
NOTE: *Enhanced only reported. For the UK, routine MMR was recalculated to cover the same years as the enhanced system.

Figure C6.3 Changes in maternal mortality ratios from routine sources between 2006-2010 and 2011-2015



NOTE: Iceland had no maternal deaths in 2006-2010 and Malta none in 2011-2015.
* Second-period ratio data not from 2011-2015: Spain 2010-2014, France 2010-2014, Italy 2006-2012, Luxembourg 2012-2013, Poland 2010-2014, Sweden 2010-2014, Switzerland 2010-2014.
** First-period ratio data not from 2006-2010: Denmark 2005-2009, Italy 2006-2009, Slovenia 2006-2009, France 2005-2009, United Kingdom 2006-2008, Portugal 2003-2007.

Figure C6.4 Maternal mortality ratios by maternal age



BABIES' HEALTH: MORTALITY AND MORBIDITY DURING PREGNANCY AND IN THE FIRST YEAR OF LIFE

6. BABIES' HEALTH: MORTALITY AND MORBIDITY DURING PREGNANCY AND IN THE FIRST YEAR OF LIFE

CORE

Fetal mortality rate by gestational age, birth weight, and plurality (C1)
Neonatal mortality rate by gestational age, birth weight, and plurality (C2)
Infant mortality rate by gestational age, birth weight, and plurality (C3)
Distribution of birth weight by vital status, gestational age, and plurality (C4)
Distribution of gestational age by vital status and plurality (C5)

RECOMMENDED INDICATORS NOT INCLUDED IN THIS REPORT

Prevalence of selected congenital anomalies (R1)
Distribution of 5-minute Apgar scores as a percentage of live births (R2)
Fetal and neonatal deaths due to congenital anomalies (R3)
Prevalence of cerebral palsy (R4)

Outcomes related to the health of babies in the first year of life, specifically mortality rates, are often used as proxy measures of the health status of a population or of the quality of the perinatal healthcare system. The main contributory factors to perinatal death include congenital anomalies, very preterm birth, and fetal growth restriction. Maternal age, parity, multiple pregnancy, maternal conditions such as preeclampsia and diabetes, socioeconomic and migration status, and behaviours such as smoking are well-known risk factors for perinatal mortality and morbidity in high-income countries. The quality of care during pregnancy, delivery, and the neonatal period also influences babies' chances of mortality and morbidity.

The Euro-Peristat indicators of child health include five core indicators, which are presented in this report, and four recommended indicators. The recommended indicators are: prevalence of selected congenital anomalies (provided by EUROCAT congenital anomaly registries) (R1); distribution of 5-minute Apgar scores as a percentage of live births (R2); fetal and neonatal deaths due to congenital anomalies (R3); and prevalence of cerebral palsy (provided by SCPE cerebral palsy registries) (R4).

C1. FETAL MORTALITY

JUSTIFICATION

Over the past decade, clinicians, researchers, public health advocates, and parents' groups have raised the profile of fetal mortality, also called stillbirth, as a public health problem. Several key publications have alerted the international community to the lack of attention to stillbirths in maternal and child health policies, the wide gaps in knowledge about how best to prevent them, and the unacknowledged suffering faced by bereaved parents.[1-3]

Stillbirths account for more than half of all deaths occurring in the perinatal period, which begins at 22 weeks of gestation.[4] The causes of fetal death are multiple and include congenital anomalies, fetal growth restriction, abruption associated with placental pathologies, preterm birth, and other maternal complications of pregnancy, as well as infections.[2,5] However, between 30 and 50% of fetal deaths remain unexplained, and this gap impedes the development of prevention strategies.[5] Routine use of post-mortem and histological examinations would reduce this proportion, but post-mortem rates are reported to be declining in many countries.[2]

The principal modifiable risk factors for stillbirth include obesity and overweight, smoking, and older maternal age.[6] Women having their first birth face a higher risk of stillbirth as do women with multifetal pregnancies. Because fetal growth restriction accounts for a high proportion of fetal deaths, better detection and management of these cases might be an effective preventive strategy.[2, 6] Audits of fetal deaths have also called attention to the contribution of suboptimal care to their occurrence.[7] Finally, women's risks of stillbirths are correlated with their socioeconomic status. For example, stillbirth rates for women with low educational levels can be twice as high as those with high educational levels.[8]

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

The differences between countries in gestational age and birthweight criteria for reporting fetal deaths as stillbirths complicates international comparisons.[4,9] It is therefore necessary to calculate fetal mortality rates by gestational age and birth weight to derive comparable indicators when registration limits differ. Because of these differences between countries, the World Health Organization has recommended limiting international comparisons to third trimester stillbirths, defined by a birthweight cutoff of 1000 g or a gestational age cutoff of 28 completed weeks.[10] Euro-Peristat chose to use the gestational age cutoff of 28 completed weeks for its comparisons, as opposed to a birthweight cutoff, because criteria for registration of stillbirths in most countries are based on gestational age. Furthermore, as fetal growth restriction is related to stillbirth, a birthweight cutoff excludes a larger proportion of fetal deaths than a gestational age cutoff does.[9]

While the use of a gestational age limit of 28 weeks has been necessary to ensure valid comparisons, it excludes the high proportion of stillbirths before 28 weeks. Recent work by Euro-Peristat shows that adopting a cutoff of 24 weeks is feasible in many European countries and would allow reliable comparisons of stillbirth rates.[11] This work showed, however, that reporting of stillbirths at 22 and 23 weeks is still highly variable and concluded that these deaths should still be excluded from international comparisons to ensure comparability. In this report, therefore, we have used both a 28- and a 24-week threshold for our main comparisons. All data, starting at 22 weeks, are reported in the summary tables.

Differences in policies and practices related to terminations of pregnancy at or after 22 weeks of gestation also affect fetal mortality rates.[12] There are several different approaches to recording and reporting terminations of pregnancy in European countries. Terminations can be registered as fetal deaths and reported in fetal mortality rates; they can also be recorded in a separate data system (ie, in an abortion registry), or not recorded at all. In some countries, terminations at or after 22 weeks are illegal or very rare. Describing each country's approach is important for comparing stillbirth indicators, and countries should be able to distinguish between spontaneous stillbirths and terminations. Further, while it is important to recognise the loss to parents of babies through terminations for congenital anomaly, the large variation in the timing of screening and regulations in Europe also makes it necessary to exclude them from stillbirth rates in cross-country comparisons.

A final issue to consider in reporting and interpreting stillbirth rates is country size. Because stillbirths are rare events, countries with small numbers of annual births, such as Cyprus, Iceland, Luxembourg, and Malta, experience greater year-to-year random fluctuations and will have wider confidence intervals around rates.

DEFINITION AND PRESENTATION OF INDICATORS

The fetal mortality rate is defined as the number of fetal deaths at or after 22 completed weeks of gestation in a given year, expressed per 1000 live births and stillbirths in the same period. When gestational age is missing, Euro-Peristat requests that fetal deaths be included if they have a birth weight of 500 g or more. Fetal mortality rates overall are presented in Summary Table C1, but also for births 1000 g or more and at or after both 28 and 24 completed weeks of gestation. Stillbirth rates are presented with and without terminations of pregnancy in the summary tables, but the rates presented in the figures in this section are calculated without terminations to improve comparability between countries. Because terminations were included in the fetal mortality rate we reported for 2010, the comparisons between 2010 and 2015 here use the 2015 rates with terminations included.

DATA SOURCES AND AVAILABILITY OF INDICATORS IN EUROPEAN COUNTRIES

Most participating countries and regions were able to provide data on fetal deaths according to the Euro-Peristat definition, as Table C1.1 shows. When countries could not provide data on fetal deaths according to our definition, they were asked to give data applying their own inclusion limits (also shown in Table C1.1). In France, data were provided from hospital discharge data as well as from the periodic national perinatal survey. As the hospital discharge data were not available for 2010, the periodic survey data are used for comparisons over time.

Countries that could only provide data with a birthweight cutoff of 500 g, as opposed to gestational age, were Austria, Belgium, the Czech Republic, Germany, Poland, and Slovenia. Countries that could only provide stillbirths starting at 24 weeks, as opposed to 22 weeks, were Ireland, England, Wales, Northern Ireland, and Hungary. Spain provided data based on a 180-day cutoff, while Bulgaria used 800 g and/or 26 weeks. Note that these cutoffs relate to the data sources used for the Euro-Peristat report – for instance, Italy uses an official registration threshold of 180 days, but records stillbirths below this threshold in another register that is also used to provide data. In Scotland, as in the other countries of the United Kingdom, only fetal deaths at 24 or more completed weeks of gestation are legally registrable as stillbirths, but fetal deaths at 22 and 23 weeks of gestation can be ascertained from hospital data. Information was therefore provided for all fetal deaths from 22 weeks onwards. These differences in recording practices mostly affect births at 22 and 23 weeks, which is why a threshold of at least 24 weeks is used for the data presented in this section. However, all data are presented in the summary tables.

Table C1.1 also indicates the ability to identify terminations of pregnancy when these take place at or after 22 weeks. Most countries either do not allow terminations after 22 weeks or were able to provide data on the numbers of stillbirths after excluding terminations. The exceptions were Belgium, the Netherlands, and Cyprus, where terminations cannot be distinguished from spontaneous stillbirths.

In most countries, information on gestational age was missing for between 0 and 3% of stillbirths. Exceptions were Spain (11.7%), Cyprus (22.6%), the Netherlands (4.3%), and Slovakia (3.8%). A larger number of countries had proportions of missing data exceeding 3% for birth weight: Spain (8.5%), France (12.6%), Italy (14.8%), Cyprus (17.0%), Hungary (12.6%), and Scotland (7.1%). Because cases with missing data are not included when a gestational age or birthweight limit is imposed, rates in countries with substantial missing data should be interpreted with caution.

RESULTS

As Figure C1.1 shows, stillbirth rates at or after 28 weeks of gestation in 2015 were 2.2 per 1000 total births or lower in Cyprus, Iceland, Denmark, Finland, and the Netherlands. At the higher end, Bulgaria had a rate of 5.7, while Hungary, Romania, Slovakia, Latvia, and Ireland had rates of 3.4 or higher. Some countries with rates at the extremes had a small number of total births, as indicated in parentheses after the country name; their rates are therefore more subject to random variation.

The general ranking of countries is similar regardless of whether the gestational age threshold was 24 or 28 weeks of gestation. There were some exceptions, notably Belgium where terminations cannot be excluded from the total number of deaths and terminations are more likely to occur at the lower gestational ages. France also has a higher number of stillbirths from 24 to 27 weeks than would be expected from its stillbirth rates at 28 weeks or higher, but terminations do not explain this, as they are not included. The notably small numbers of stillbirths from 24 to 27 weeks in some countries, particularly Romania and Slovakia, suggest under-reporting at these gestational ages.

CHANGE IN FETAL MORTALITY RATES BETWEEN 2010 AND 2015

Figure C1.2 displays rates at and after 28 weeks in 2010 and 2015. The figure reveals highly variable changes between 2010 and 2015. To help assess these changes, Figure C1.3 presents risk ratios, giving the percentage change over time as well as confidence intervals to show the uncertainty around these estimates. The pooled risk ratio estimate between 2010 and 2015 was 0.95 (95% confidence intervals: 0.90-0.99), with statistically significant heterogeneity across countries. This graph shows that some countries experienced significant declines, some had stable rates, while rates rose in a few.

KEY POINTS

- Almost all countries have stillbirth rates between 2.0 and 3.5 per 1000 total births at and after 28 weeks of gestation and between 2.5 and 4.5 per 1000 total births at and after 24 weeks of gestation. Accordingly, there were around 60-80% more stillbirths in the countries with the higher rates than in those with the lower rates.
- Overall, stillbirth rates fell between 2010 and 2015, but trends were very heterogeneous. Some countries experienced significant reductions in their stillbirth rates, including the Netherlands, Poland, Scotland, and England and Wales, whereas rates were stable or increased elsewhere.
- This heterogeneity in changes in stillbirth rates in 2010 and 2015 calls for more investigation of the health policies and changes in practices in the countries where stillbirth rates declined.

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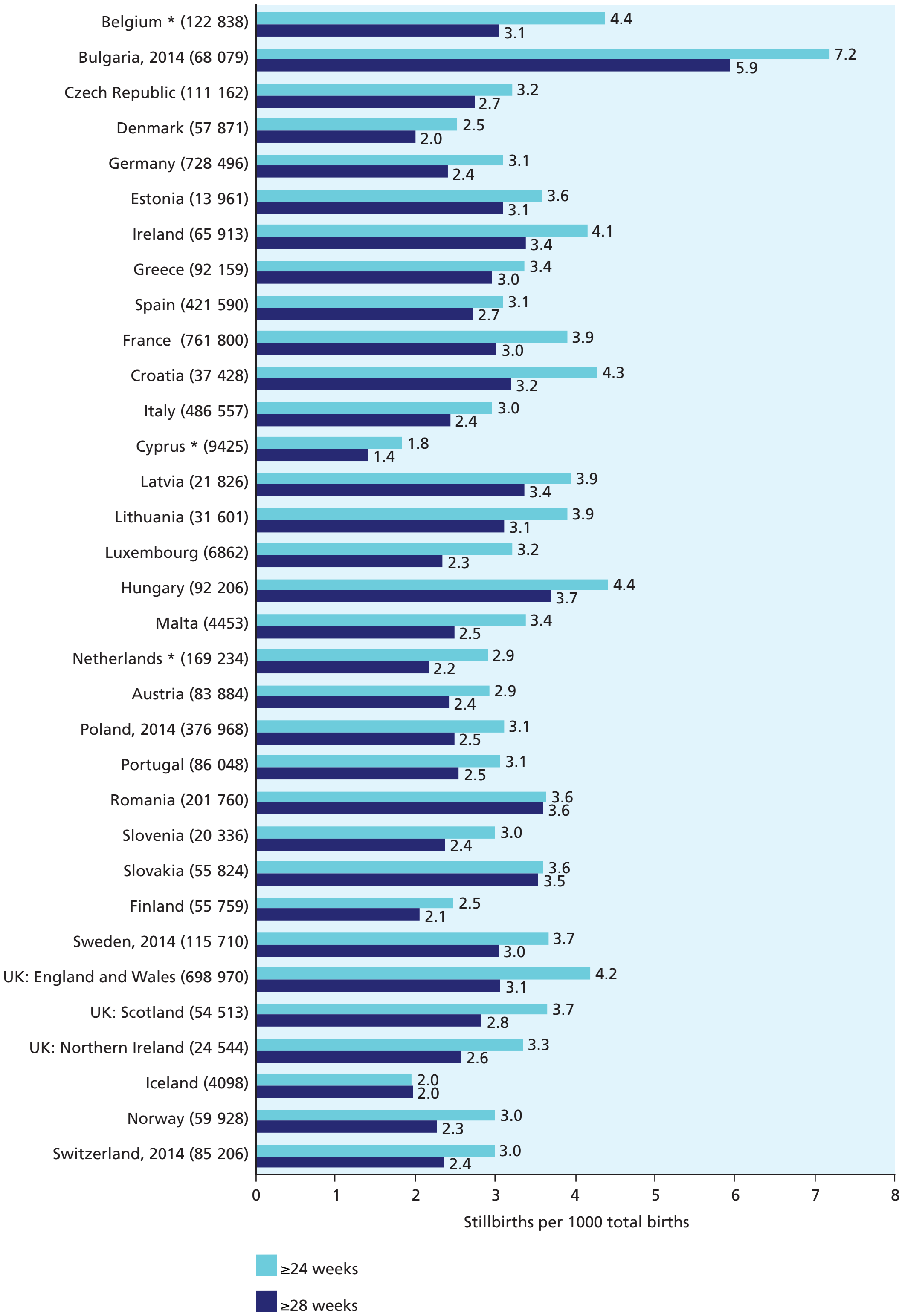
Table C1.1 Ability to provide stillbirth data according to Euro-Peristat's inclusion criteria and ability to remove terminations of pregnancy from stillbirth statistics

Inclusion criteria	No terminations of pregnancy** or can exclude terminations	Terminations of pregnancy cannot be excluded
Euro-Peristat criteria*: ≥22 weeks of gestational age or if gestational age is missing, ≥500 grams	Denmark, Estonia, France, Croatia, Latvia, Lithuania, Luxembourg, Greece, Romania, Malta, Portugal, Slovakia, Finland, Sweden, Norway, Iceland, Switzerland, Italy***, UK (Scotland)	Netherlands, Cyprus
Use of other criteria:		
≥ 500 grams	Austria, Czech Republic, Germany, Poland, Slovenia	Belgium
≥ 24 weeks	Ireland, Hungary, UK (England and Wales, Northern Ireland)	
≥ 180 days	Spain	
≥ 800 grams/26 weeks	Bulgaria: 800 grams and/or 26 weeks	

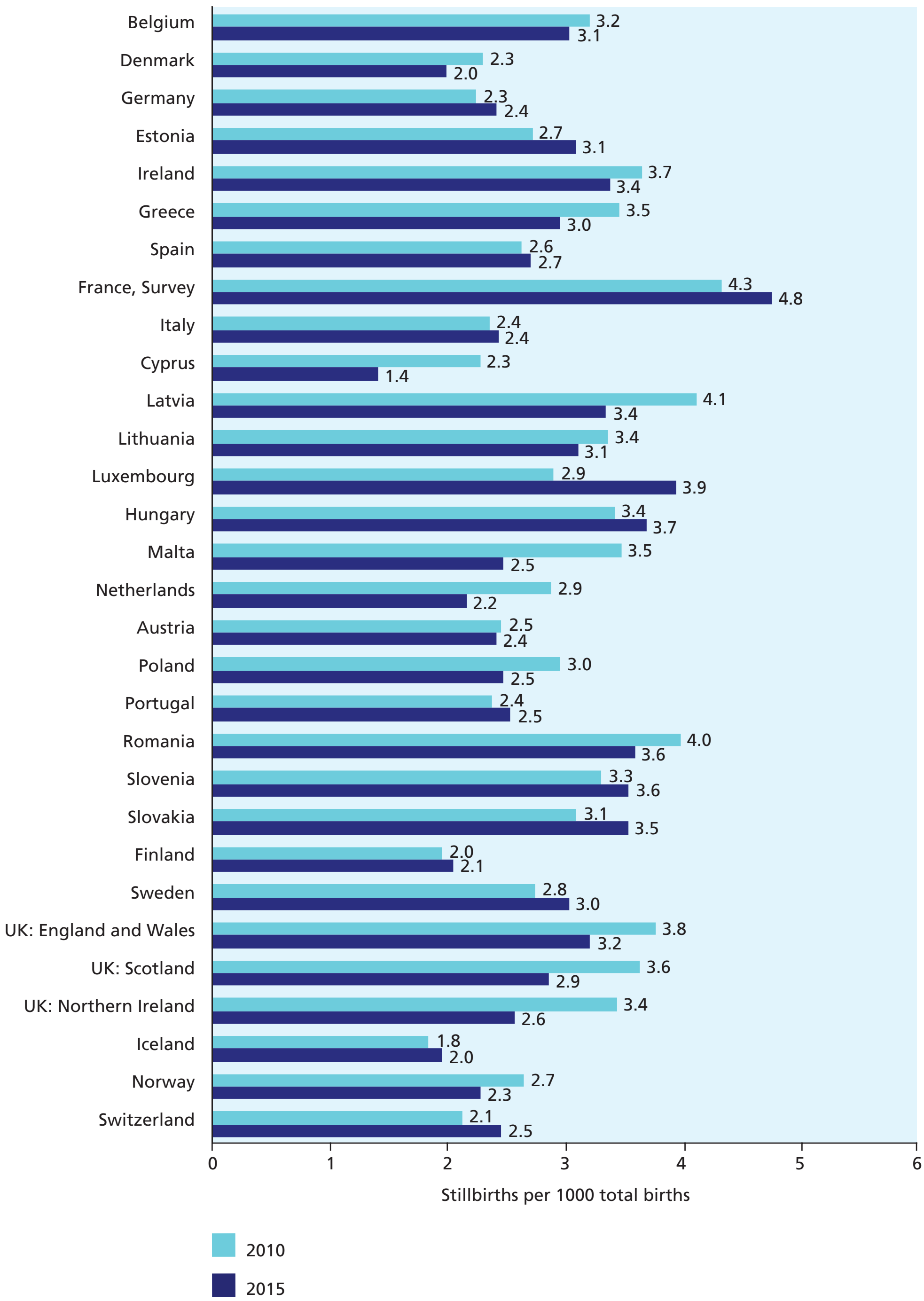
Note: * Registration and recording guidelines differ in this group of countries, but all are able to provide stillbirth data starting at 22 weeks of gestation.
** Or terminations are rare above the registration limit for stillbirths and unlikely to affect stillbirth statistics.
*** 180 days or more for stillbirths and < 180 days for spontaneous abortions, but have been combined for this report.

Figure C1.1 Stillbirth rates at and after 24 weeks and 28 weeks of gestation in 2015



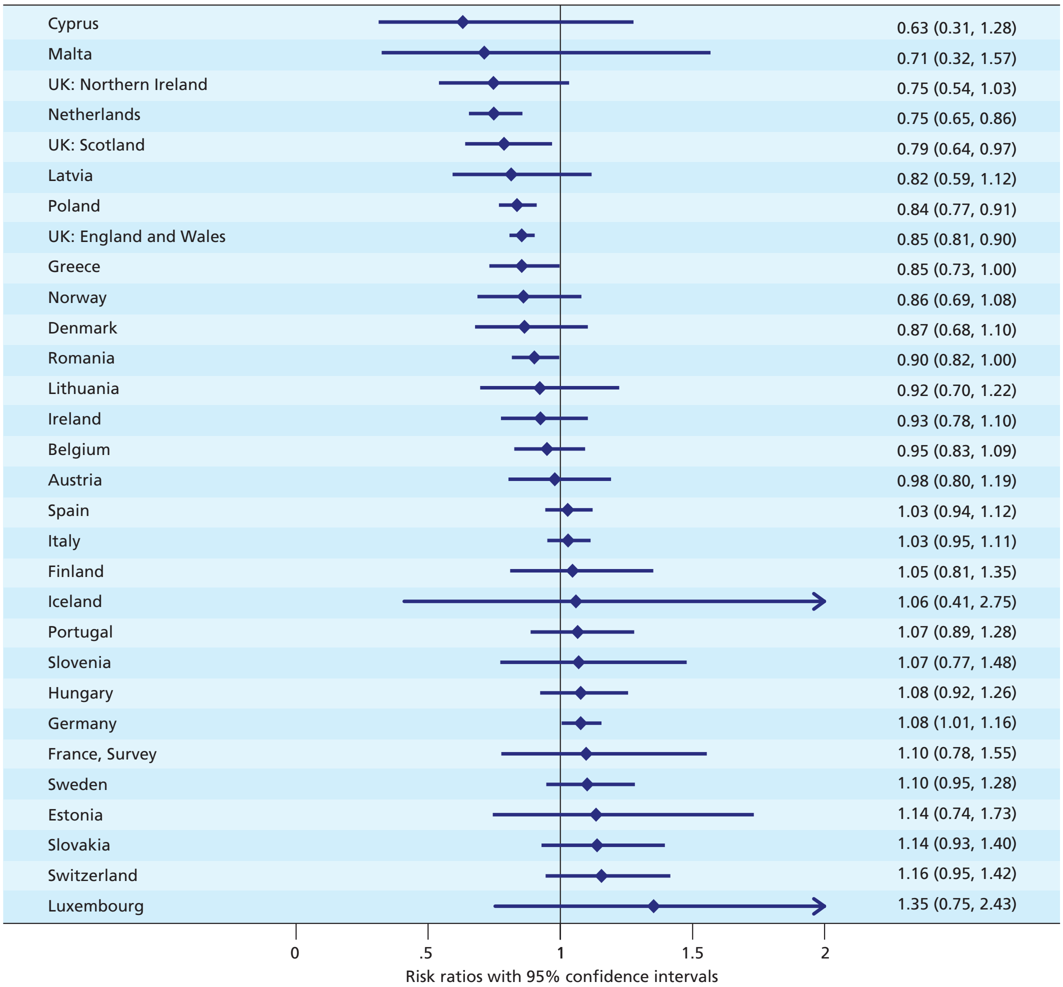
NOTE: For countries that register terminations of pregnancy as stillbirths, terminations were removed when this was possible. Total number of births (without terminations, when possible) indicated in parentheses after country name; *cannot remove terminations of pregnancy.

Figure C1.2 Stillbirth rates at and after 28 weeks of gestation in 2010 and 2015



NOTE: Data for Luxembourg, France, Slovenia, England & Wales, Scotland, and Switzerland differ between Figure C1.1. and C1.2. because rates in C1.1 were calculated without terminations, while those for C1.2 were calculated including terminations. These differences are generally small, except for France.[12] Data from France come from a different source than that used in Figure C1.1.
First-period data not from 2010: Greece 2009, Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Poland 2014, Sweden 2014, Switzerland 2014.

C1.3 Comparison of stillbirth rates at and after 28 weeks, 2010 and 2015 (risk ratios and 95% confidence intervals)



NOTE: Overall random effects estimate: 0.95 (95% CI: 0.90-0.99).
I^2=66.2% Chi squared tests of heterogeneity: 37.80. (d.f. = 29), $p < 0.001$.
First-period data not from 2010: Greece 2009, Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Poland 2014, Sweden 2014, Switzerland 2014.

C2 NEONATAL MORTALITY

JUSTIFICATION

The neonatal mortality rate is a key indicator of health and care during pregnancy and birth. Neonatal deaths are deaths 0-27 days after live birth. They are often subdivided by timing of death into early neonatal deaths, 0-6 days after live birth, and late neonatal deaths, 7-27 days after live birth. The principal causes of neonatal death in high-income countries are congenital anomalies[1] and complications associated with very preterm birth (see C5). Babies from multiple pregnancies have neonatal mortality rates 4-6 times higher than singletons, primarily because they are born at lower gestational ages.[2] Neonatal deaths can also be associated with suboptimal care, including factors related to health care and the healthcare system. For very preterm births, birth in a maternity ward with an on-site neonatal intensive care unit is associated with lower mortality,[3] while delivery in a less specialised maternity unit or in midwife-led care can offer women with uncomplicated pregnancies levels of adverse outcome that are at least as good, combined with lower intervention rates.[4]

The first *European Perinatal Health Report* showed wide variations in neonatal mortality rates in participating countries in 2004, and the second *European Perinatal Health Report* described their persistence in 2010.[5, 6] In addition, countries differed in their patterns of early and late neonatal deaths. In 2004, new member states of the European Union had high early and late neonatal mortality rates, while in other countries patterns of either low early with high late or high early and low late rates were observed.[7] Similar patterns persisted in 2010. Large declines in neonatal mortality rates in participating countries between 2004 and 2010 affected all gestational ages and were observed in both high- and low-mortality countries.[8] Neonatal mortality rates due to congenital anomalies remained higher in some countries where terminations of pregnancy were not legal.[9]

The wide variation in gestational age-specific neonatal mortality rates at 22-23 weeks in 2004 suggested that not all births and deaths occurring very early in the neonatal period were systematically included, and this too persisted in 2010. This finding was unsurprising as even within countries, the reporting of births as stillbirths or live births at these extremely preterm gestational ages can show substantial heterogeneity that suggests differential reporting thresholds and practices.[10] Variations in neonatal mortality rates between countries may also reflect differences in policies between European countries related to the resuscitation of babies at the limit of viability.[10]

DEFINITION AND PRESENTATION OF INDICATORS

Data on neonatal deaths are compiled by timing of death, gestational age, birth weight, and plurality and used to construct annual and cohort mortality rates. The annual neonatal mortality rate is defined as the number of deaths during the neonatal period after live birth at or after 22 completed weeks of gestation occurring during the year, expressed as a rate per 1000 live births in the same year. The cohort neonatal mortality rate is defined as the number of neonatal deaths among babies born at or after 22 completed weeks of gestation in a given year, expressed as a rate per 1000 live births in the same year. When gestational-age data were missing, births and deaths were included if they had a birth weight of at least 500 g. If both gestational age and birth weight were missing, the birth or death was not included. In some countries, however, births and deaths with missing gestational age and birth weight could be included if they were known to have occurred at 22 or more weeks of gestation.

Usually the annual and cohort neonatal death rates are very similar as they only reflect differences at the beginning and end of the year. However, differences can be more marked in countries with a small population or when comparing neonatal mortality rates by subgroups. To obtain cohort rates, information about births and deaths need to be available in the same source. Although not all countries currently have this data available, Euro-Peristat recommends this minimal linkage for all countries.[11] This report provides both annual and cohort rates in the summary tables. When only one neonatal mortality rate is shown and both cohort and annual rates are available, we used the cohort rate.

DATA SOURCES AND AVAILABILITY OF INDICATORS IN EUROPEAN COUNTRIES

All participating countries were able to provide some data for neonatal deaths. Data were from 2014 in Bulgaria, Poland, Sweden, England and Wales, and Switzerland. Data about deaths but not births were available from UK confidential enquiries. Thirteen countries or regions provided only annual neonatal deaths, 12 provided both annual and cohort neonatal deaths, and 9 submitted only cohort neonatal death data. Differences among the 12 countries where annual and cohort neonatal mortality rates could be compared were minimal except in Scotland, where difficulties in linking deaths (in particular, early neonatal deaths) back to the corresponding birth record meant that the cohort neonatal mortality rate systematically underestimated the actual rate. For this reason, the annual neonatal mortality rate (produced from unlinked data and hence complete) is preferred for Scotland. Germany, Greece, Italy, Spain, and Portugal were unable to provide data on neonatal deaths by gestational age, and the data for Hungary divided all gestational ages into only two groups: 24-31 weeks and at and after 31 weeks. Germany, Greece, Spain, Italy, and Portugal were unable to contribute data by birth weight, and Bulgaria, Germany, Greece, Spain, and Hungary could not contribute data by plurality. Data from Ireland concerned only early neonatal deaths.

In many countries, there were no or few (<4%) missing data for the gestational age of neonatal deaths. Exceptions included Belgium (5.8%), the Czech Republic (6.5%), Luxembourg (22.2%), and Romania (20.5%). In France, 14.0% of the data were missing, but Euro-Peristat received data corrected for the missing cases. Proportions of missing birthweight data greater than 4% were reported in Belgium (6.3%), Denmark (10.1%), France (13.1%), Lithuania (4.1%), Luxembourg (27.3%), and England and Wales (12.0%). Cases with missing data are not included when a gestational age or birthweight limit is imposed, therefore rates in countries with high missing data rates should be interpreted with caution. For countries with more than 10% missing for gestational age, we estimate rates corrected for missing cases in the text below.

METHODOLOGICAL ISSUES IN THE CALCULATION, REPORTING, AND INTERPRETATION OF THE INDICATORS

Comparisons of neonatal mortality rates at early gestational ages must be combined with analyses of fetal mortality rates, since it is possible that some early neonatal deaths may be recorded as fetal deaths and vice versa. Some registration and data recording systems impose a lower limit of 500 grams for inclusion of births. This can create limitations in comparing neonatal mortality rates at low gestational ages. Nonetheless, because of the differences in the recording of births before 24 weeks, Euro-Peristat recommends that comparative analyses use a 24-week threshold.[7, 12]

Neonatal deaths are rare events. Therefore, in countries with a small number of annual births, such as Cyprus, Iceland, Luxembourg, and Malta, year-to-year random fluctuations are naturally greater and the confidence intervals around their rates wide.

RESULTS

Neonatal mortality rates ranged from 1.2 per 1000 live births in Iceland to 4.3 per 1000 in Romania and 4.4 per 1000 in Bulgaria, as seen in Figure C2.1, which shows neonatal mortality rates subdivided by timing of death into early and late neonatal mortality rates. Between 63.3 and 84.3% of all neonatal deaths in participating countries occurred during the early neonatal period. In Bulgaria and Romania, late neonatal mortality rates exceeded 1.0 per 1000 live births.

After the exclusion of births and deaths before 24 weeks of gestation, neonatal mortality rates ranged from 0.4 per 1000 live births in Slovenia to 4.5 in Bulgaria, as shown in Figure C2.2. Bulgaria, Malta, Romania, and Northern Ireland had rates exceeding 3.0 per 1000 at gestations of 24 weeks or more. In contrast, the Czech Republic, Denmark, Estonia, Cyprus, Luxembourg, Austria, Slovenia, Finland, Sweden, Norway, and Iceland had rates below 1.5 per 1000 live births. Note that some countries had high proportions of missing data for gestational age, which led to excluding some cases from these rates. If data are corrected, under the assumption that missing data are distributed according to the observed gestational age distribution, rates at or over 24 weeks of gestation are: 1.7 instead of 1.6 in Belgium, 1.3 instead of 1.2 in the Czech Republic, 1.4 instead of 1.2 in Luxembourg, and 4.2 instead of 3.5 in Romania. Countries where terminations of pregnancy were either not legal, as in Malta and the Irish Republic, or not usually available, as in Northern Ireland, were among those with high neonatal mortality rates, probably attributable to deaths from lethal congenital anomalies.

Babies born before 28 weeks of gestation or weighing less than 1000 grams accounted for approximately 40% of all neonatal deaths, as shown in Figure C2.3, which combines all countries for which data were available for neonatal deaths at or after 22 weeks of gestation. Data were not available by gestational age for Germany, Greece, Spain, Italy, Hungary, Portugal, or Scotland. Slightly over a quarter of the deaths were of term babies, while 18.9% were born at 22-23 weeks of gestation and 12.8% had a birth weight less than 500 grams.

COMPARISON WITH 2010 DATA

Comparisons of neonatal mortality rates at or after 24 completed weeks of gestation in 2010 and 2015 were possible for 22 European countries and are presented in Figures C2.4 and C2.5. Neonatal mortality rates declined in most countries. The largest absolute decreases in rates were seen in Slovenia, Latvia, Malta, Romania, and Poland. With the exception of Slovenia, these countries had higher rates in 2010 than many other European countries. When viewed as percentage changes, as in Figure C2.5, Slovenia, Iceland, Latvia, Norway, and the Czech Republic reduced their rates by 25% or more. However, the confidence interval in Iceland was wide, and the difference not significant. The pooled estimate of the risk ratio between 2010 and 2015 for neonatal mortality at or after 24 weeks was 0.86 (95% confidence interval 0.80-0.91) in the 22 countries that could provide data. This risk ratio was negative, but less pronounced for neonatal mortality at or after 22 weeks of gestation in 26 countries providing data. Heterogeneity between the countries was significant in both comparisons.

KEY POINTS

- Wide differences in neonatal mortality rates persisted in participating countries in 2015. Compared with 2010, rates declined in many of these countries. Some large declines were observed among some of the countries that were new member states of the European Union in 2004, but also among some countries with low neonatal mortality rates in 2004 and 2010. Overall decreases in neonatal mortality were more pronounced after removing births at 22 and 23 weeks of gestation.
- These data raise questions about the reasons for these disparities in neonatal mortality in Europe. While methodological issues related to registration are less problematic for neonatal than for fetal mortality rates, the inclusion criteria of 500 grams or 22 weeks used in some countries may result in lower neonatal mortality rates than in countries where there is no limit for inclusion. Differences in ethical and clinical decisions about babies born very preterm may also contribute to the disparities observed.

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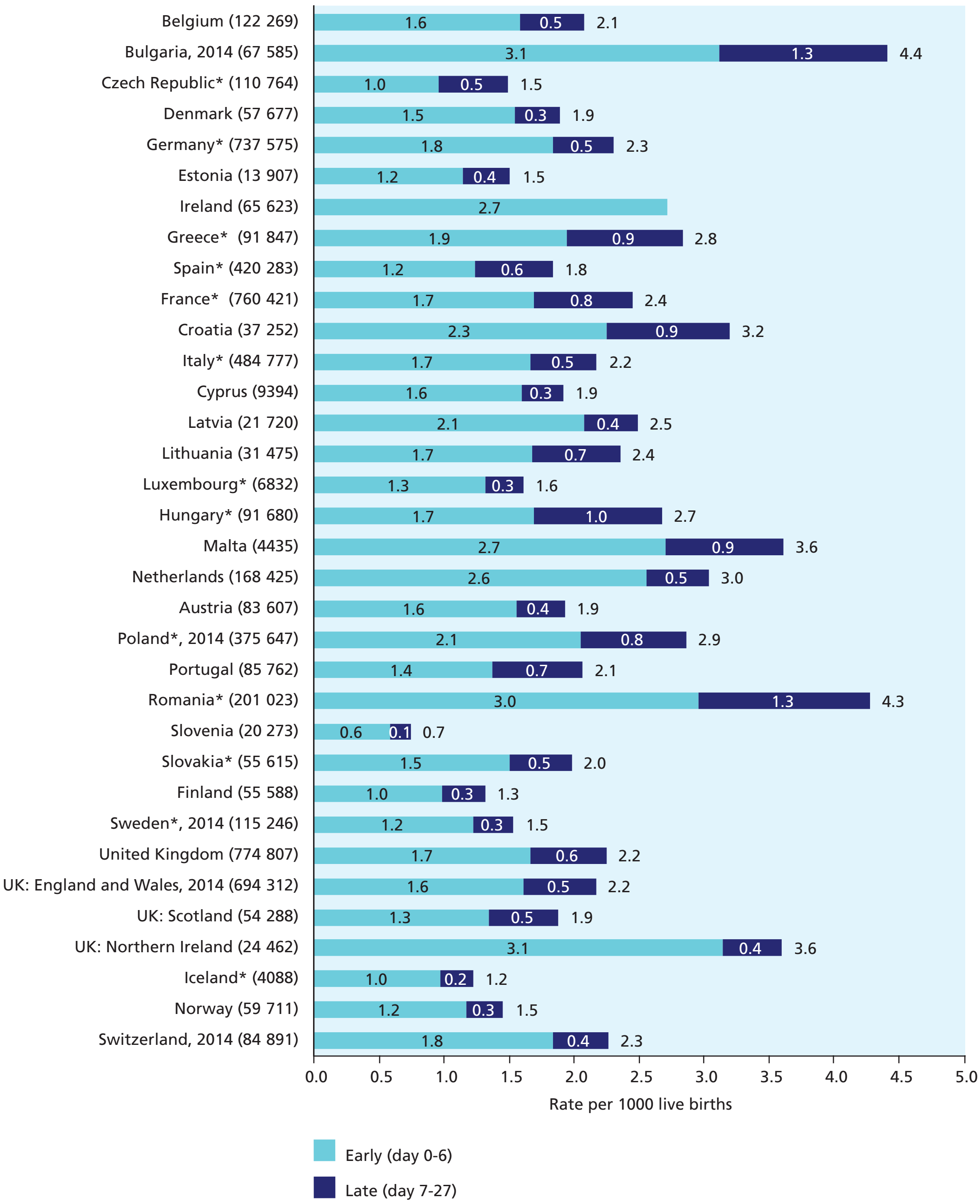
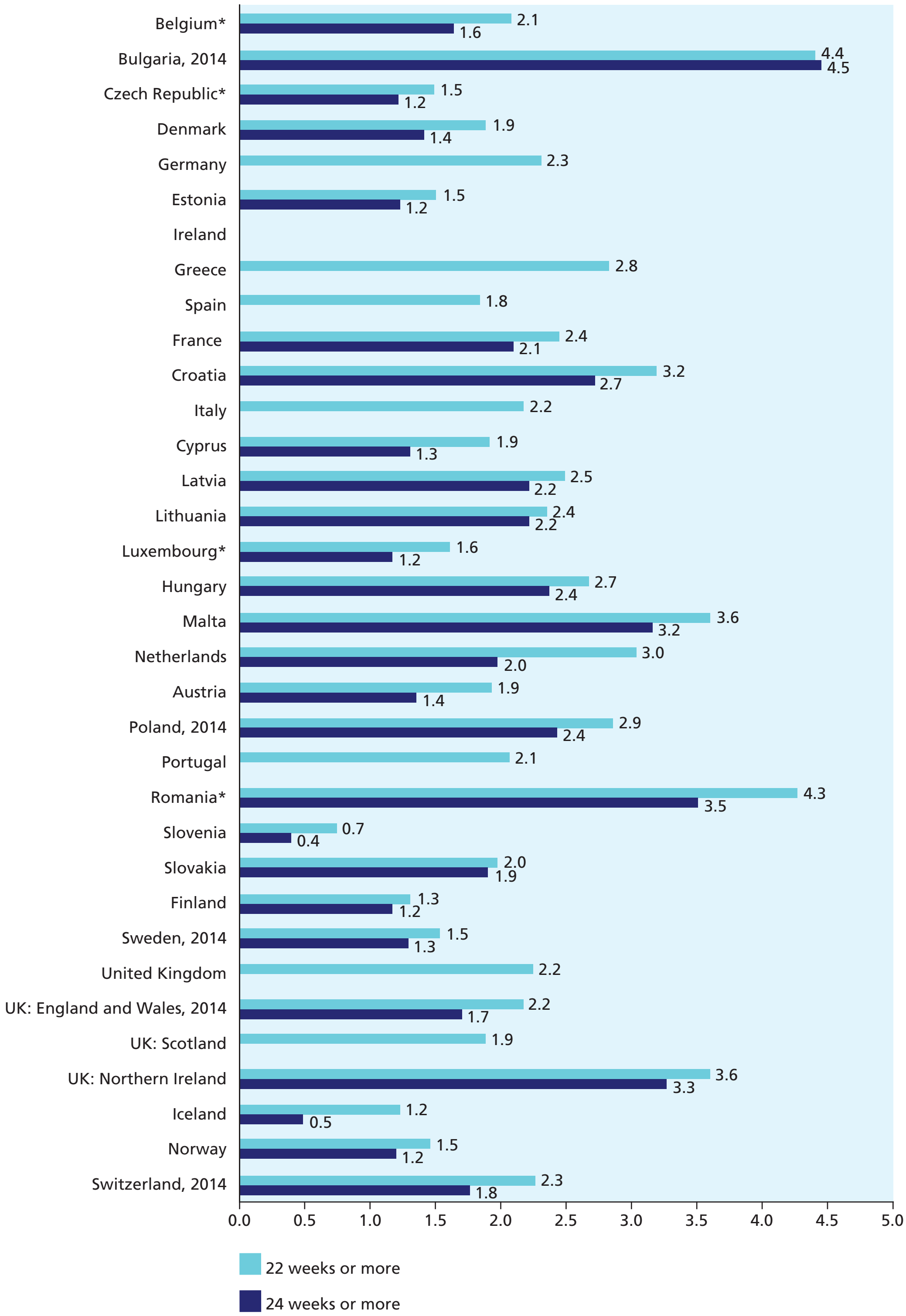
Figure C2.1 Early and late neonatal mortality rates at and after 22 weeks of gestation in 2015



NOTE: Total number of live births in parentheses after country name.
*Cohort data except for Bulgaria, Czech Republic, Germany, Greece, Spain, France, Italy, Luxembourg, Hungary, Poland, Romania, Slovakia, Scotland, Sweden, and Iceland

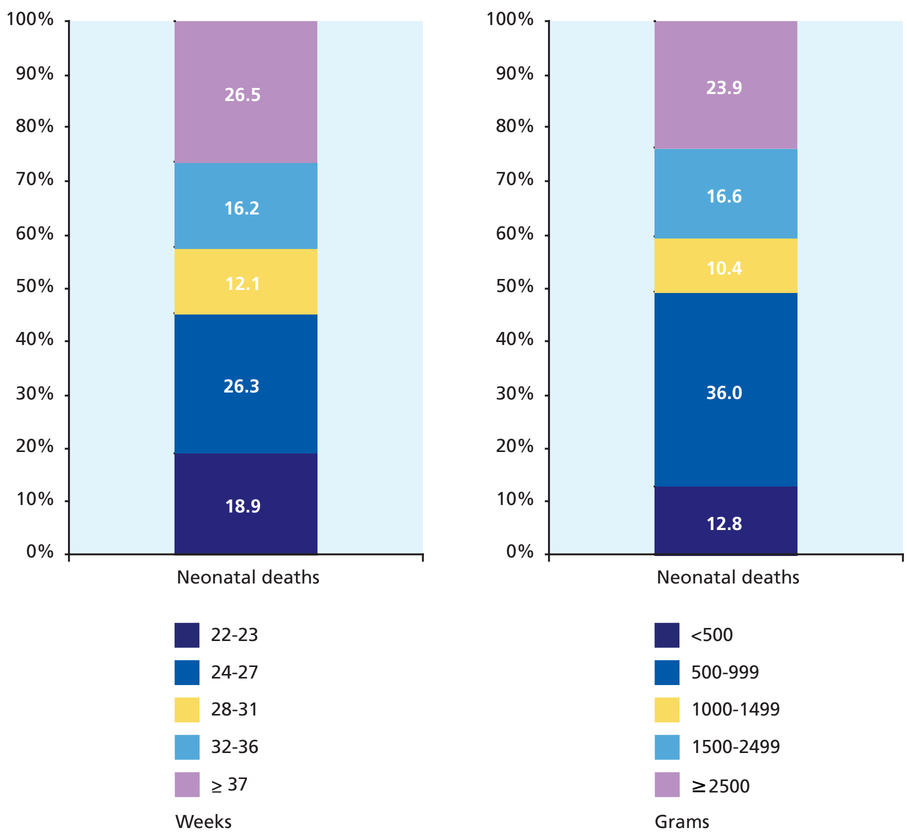
Figure C2.2 Neonatal mortality rates at and after 22 and 24 weeks of gestation in 2015



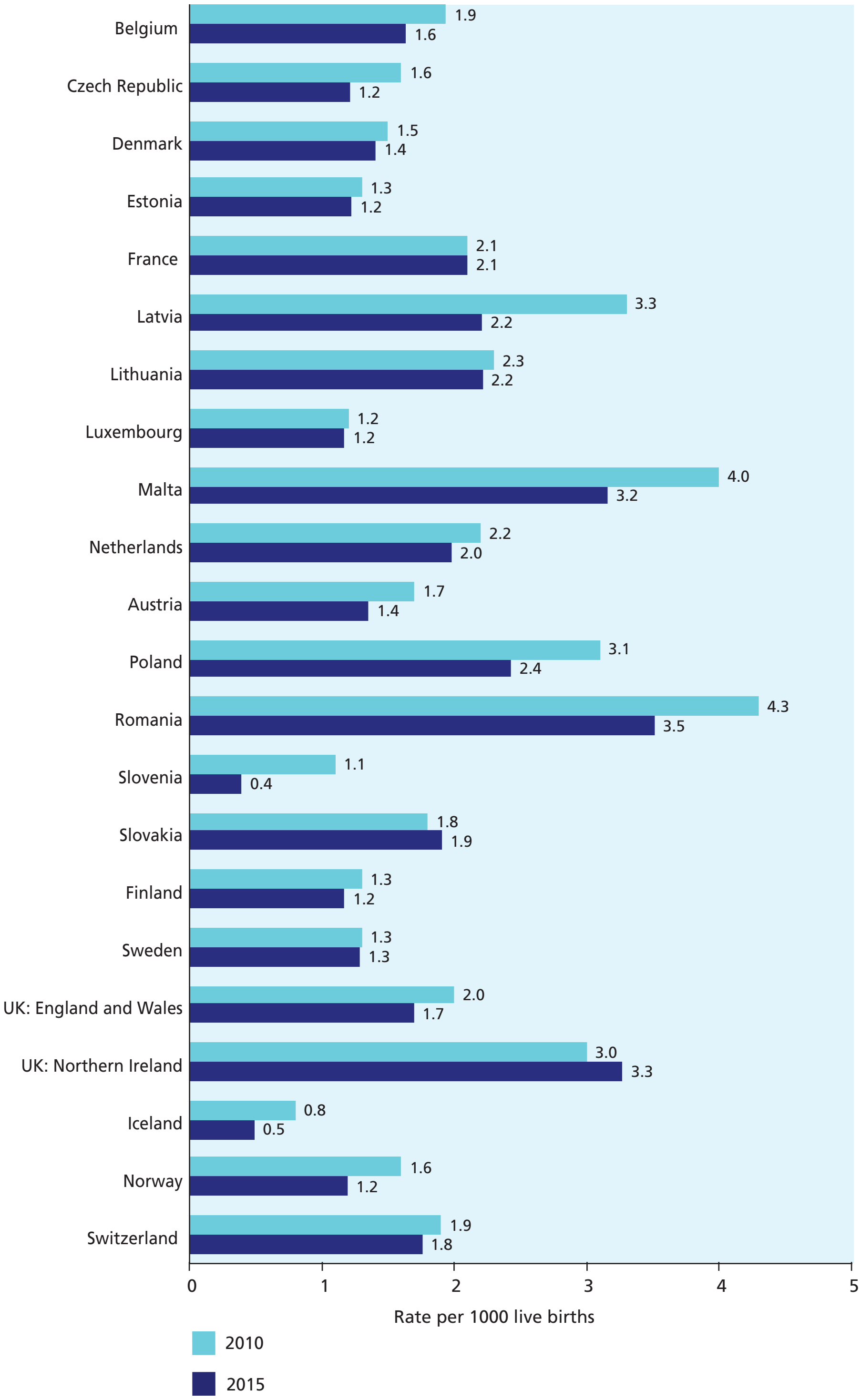
NOTE: * More than 5% data missing for gestational age: Belgium (5.8%), the Czech Republic (6.5%), Luxembourg (22.2%), Romania (20.5%); see text for estimated corrected rates. These cases are excluded from rates calculated for births 24 weeks and later.

Figure C2.3 **Distribution of neonatal deaths by gestational age (A) and by birth weight (B) for all births at and after 22 weeks of gestation for all countries contributing data in 2015**

A. By gestational age group **B. By birthweight group**

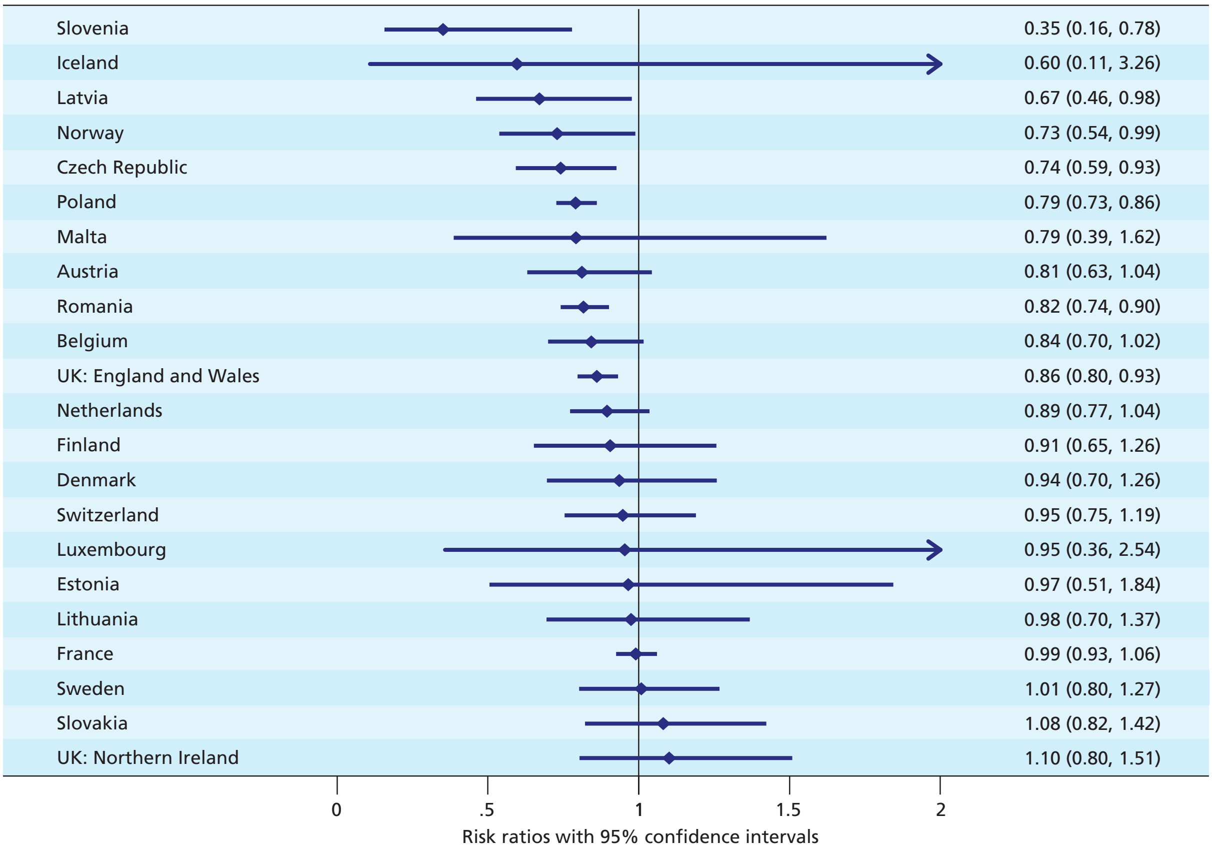


C2.4 Neonatal mortality rates at and after 24 weeks of gestation in 2010 and 2015



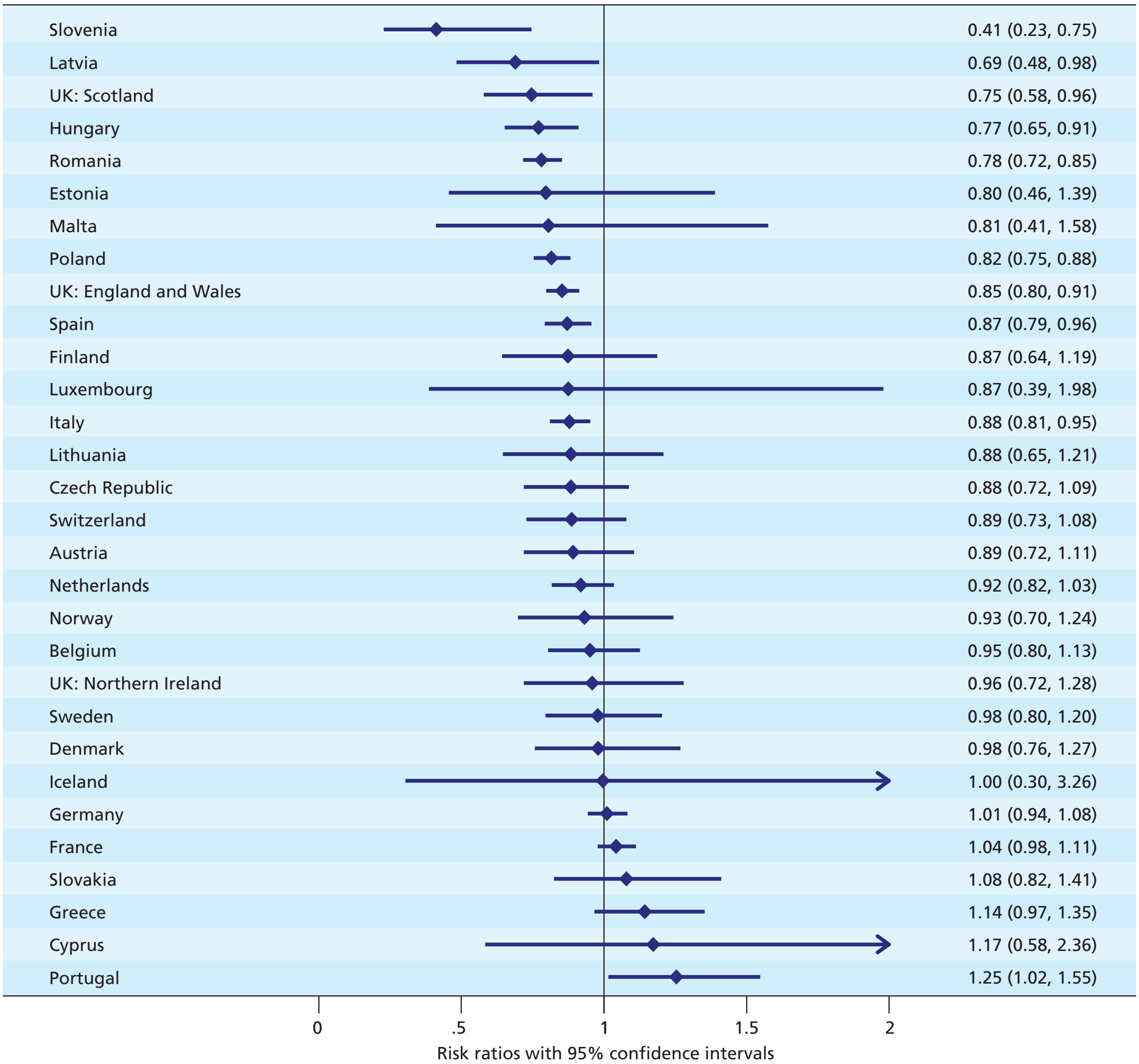
NOTE: First-period data not from 2010: Greece 2009, Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Poland 2014, Sweden 2014, Switzerland 2014, UK: England and Wales 2014.

C2.5 Comparison of neonatal mortality rates at and after 24 weeks of gestation, 2010 and 2015 (risk ratios and 95% confidence intervals)



NOTE: Pooled random effects estimate 0.86 (95% CI: 0.80-91).
I^2 = 50.5% Chi squared tests of heterogeneity = 42.45 (d.f. = 21), p = 0.004.
Second period data not from 2015: Poland 2014, Sweden 2014, Switzerland 2014, UK: England and Wales 2014.

C2.6 Comparison of neonatal mortality rates at and after 22 weeks of gestation, 2010 and 2015 (risk ratios and 95% confidence intervals)



NOTE: Pooled random effects estimate: 0.90 (95% CI: 0.85-0.94).
I-squared = 66.8% Chi squared tests of heterogeneity = 87.39 (d.f. = 29), p < 0.001.
First-period data not from 2010: Cyprus 2007.
Second-period data not from 2015: Poland 2014, Sweden 2014, Switzerland 2014, UK: England and Wales 2014.

C3 INFANT MORTALITY

JUSTIFICATION

The infant mortality rate, which measures the number of deaths before one year of age after live birth per 1000 live births, is a widely used measure of population health. Although it extends beyond the perinatal period, the Euro-Peristat group includes infant mortality as a core indicator because it reflects the longer-term consequences of perinatal morbidity. Measuring deaths beyond the neonatal period is particularly relevant for very preterm or low birthweight babies or babies with congenital anomalies, as they remain at higher risk of death throughout their first year of life.[1,2] While most infant deaths attributable to perinatal causes occur soon after birth, some very ill babies admitted to neonatal units may survive the neonatal period but die later in their first year of life. Furthermore, developments in neonatal care for these high-risk babies can influence the proportions of infant deaths occurring after the neonatal period and affect comparisons of mortality over time and between countries.[3] In a study of all US full term infant deaths in 2010-2012, perinatal conditions and congenital anomalies accounted for almost 99% of all early neonatal deaths and almost two thirds of late neonatal deaths. Nonetheless, 63.5% of infant deaths occurred during the post-neonatal period, and 60% of them were due to sudden unexpected death in infancy, while perinatal conditions and congenital anomalies accounted for barely 20%.[4] The post-neonatal mortality rate is more highly correlated with social factors than the neonatal mortality rate is.[5] Infant mortality is therefore an indicator of both the quality of medical care and the effectiveness of services and policies aimed at the reduction of health inequalities.

DEFINITION AND PRESENTATION OF INDICATOR

Data about infant deaths are compiled on both an annual and a cohort basis, subdivided by gestational age, birth weight, and plurality. They are presented in Summary Table C3. The annual infant mortality rate is defined as the number of infant deaths 0-364 days after live birth at or after 22 completed weeks of gestation occurring in 2015, expressed as a rate per 1000 live births occurring in 2015. The cohort infant mortality rate is defined as the number of deaths 0-364 days after live birth at or after 22 completed weeks of gestation among babies born in 2015, expressed as a rate per 1000 live births in 2015. Euro-Peristat inclusion rules state that when gestational age is missing, deaths should be included if the birth weight is equal to or over 500 grams. To standardise comparisons, Euro-Peristat also calculates the infant mortality rate after removing births at very early gestational ages (22 and 23 weeks, see C2 for full discussion).

DATA SOURCES AND AVAILABILITY OF INDICATOR IN EUROPEAN COUNTRIES

All countries provided data on the infant mortality rate. Data from Bulgaria, Poland, Sweden, England and Wales, and Switzerland were from 2014. As with neonatal mortality, we used cohort mortality rates when these were available (Austria, Belgium, Croatia, Cyprus, Denmark, Estonia, Finland, Latvia, Lithuania, Malta, Norway, Slovenia, Switzerland, and the countries of the UK). For other countries we used annual rates. For the countries that had both (Croatia, Cyprus, Estonia, Austria, Finland, Latvia, Lithuania, Norway, and Switzerland), differences were small except in Scotland, as mentioned In section C2, above, Scotland's difficulties in linking deaths (in particular early neonatal deaths) back to the corresponding birth record meant that the cohort infant mortality rate systematically underestimated the actual rate. For this reason, the annual infant mortality rate (produced from unlinked data and hence complete) is preferred for Scotland. Of the 33 participating countries, 23 countries were able to provide infant mortality rates subdivided by gestational age and 24 by birth weight, numbers similar to those able to provide these data in 2010.

Most countries had small proportions of missing data for gestational age (<3%), with some exceptions in Romania (26.3% of deaths had gestational age missing), the Czech Republic (19.1%), and Luxembourg (43.8%, but few deaths). Cases with missing data are not included when a gestational age or birthweight limit is imposed, therefore rates in countries with high rates of missing data should be interpreted cautiously. For countries with more than 10% missing data for gestational age, we provide an estimate of corrected rates in the text below.

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

Most participating countries had no lower gestational age or birthweight limit for registration of live births in 2015. This made it possible to provide data about live births based on the Euro-Peristat definition of 22+ weeks of gestation for countries that collect infant deaths by gestational age. A few countries specified limits – France, where live birth registration starts at 22 weeks or 500 grams, and Ireland, where the published reports include data only on births 500 grams or more, although live births with lower birth weights can be registered legally and were provided to Euro-Peristat when born at or after the 22 week of gestation limit. In Norway, live births and stillbirths are registered starting at 16 weeks of gestation, but births before 22 weeks with a birth weight under 500 grams are considered to be spontaneous abortions.

In many European countries, data about infant deaths after the perinatal period come from general death registration systems, which do not usually include information about birth characteristics. If gestational age is not recorded it is not possible to check adherence to the Euro-Peristat inclusion criteria or to undertake more complete analyses of the infant mortality rate. For this reason Euro-Peristat strongly recommends linking birth and death records to obtain complete information about infant deaths by gestational age, birth weight, and plurality.[6]

An additional note concerns Luxembourg, where it is estimated that about 14% of child deaths occur abroad, reflecting transfer for care to specialized centres in neighbouring countries. Cause of death registers are not notified about these deaths and they are not included in the statistics presented here.

RESULTS

As shown in Figure C3.1, infant mortality rates at or after 22 completed weeks of gestation in 2015 varied widely, ranging from 1.5 per 1000 live births in Iceland to 5.2 in Malta, 5.1 in Northern Ireland, 7.4 in Romania, and 7.6 in Bulgaria. The median rate was 3.1, with an IQR of 2.3 to 3.8. Bulgaria and Romania, relatively new members of the European Union, had very high infant mortality rates, similar to those observed among the new member states of the European Union in the 2004 data collection. Although not at this level, rates were high in Malta, where termination of pregnancy is illegal, and in Northern Ireland, where the legislation enabling legal abortion in the rest of the UK does not apply.

When infant mortality rates were computed with a threshold of 24 weeks, rates were reduced by between 0.01 and 0.07 per 1000 live births. For the 21 countries that could provide this information, the median infant mortality rate with this threshold was 2.1 with an IQR of 1.8 to 2.8. Among these countries taken together, 16.3% of infant deaths thus occurred after live birth at 22 and 23 weeks. A slightly lower percentage of infant deaths involved babies who weighed less than 500 grams at birth. Overall two thirds of all deaths were of babies born before term or with a birth weight less than 2500 grams. Note that some countries had

high proportions of missing data for gestational age, which resulted in the exclusion of some cases from these rates. If data are corrected, under the assumption that missing data are distributed according to the observed gestational age distribution, rates at or after 24 weeks of gestation are: 2.1 instead of 1.8 in the Czech Republic, 1.7 instead of 1.2 in Luxembourg, and 6.8 instead of 5.4 in Romania.

COMPARISON WITH DATA FROM 2010

Of the 33 participating countries, 27 had data for infant mortality rates at or after 22 completed weeks of gestation for both 2010 and 2015. Figures C3.4 and C3.5 present these comparisons. Rates decreased in 23 countries and increased in four, Greece, Portugal, France, and Northern Ireland, although the difference in France was extremely small, lower than 0.1 per 1000 live births, and the confidence intervals for all four included 1 (see Figure C3.5). Among the seven countries with the highest rates in 2010, five, Romania, Latvia, Hungary, Lithuania, and Poland had substantial further decreases between 2010 and 2015. Rates in the other two countries with high rates in 2010, Northern Ireland and Malta, decreased only slightly. Other substantial decreases occurred in countries with a wide range of rates in 2010. Figures C3.4 and C3.5 present risk ratios between 2010 and 2015, with their 95% confidence intervals. Overall, infant mortality rates were significantly lower in 2015 than in 2010; comparisons with a 24-week threshold showed a larger decrease. However, fewer countries were able to provide these data in both periods. The heterogeneity in relative risks between countries was significant.

KEY POINTS

- Infant mortality rates declined in most, but not all, participating countries between 2015 and 2010.
- Mortality rates continue to vary greatly between countries, with rates remaining highest among the newest member states. Rates also remained relatively high in Malta and Northern Ireland.
- In countries with data available about the gestational age and birth weight of the babies who died, more than two thirds were born preterm and three quarters had a birth weight below 2500 grams.
- Only two thirds of the participating countries were able to present infant mortality data by gestational age, birth weight, and plurality, data that make it possible to monitor outcomes in the first year of life among babies at higher risk of morbidity and mortality. Routine linkage between birth data and death statistics should be set up in all countries that lack it to obtain this essential information.

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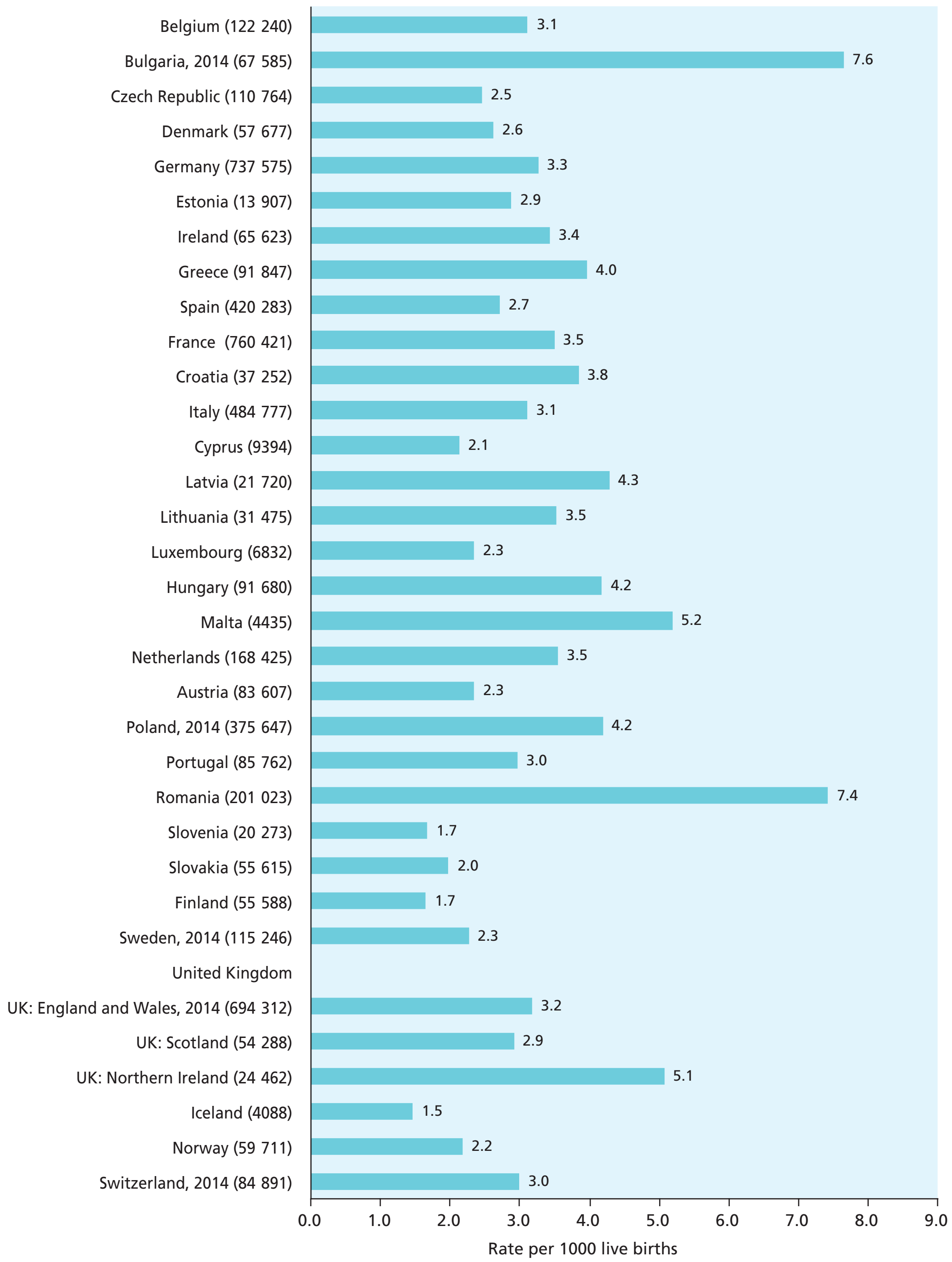
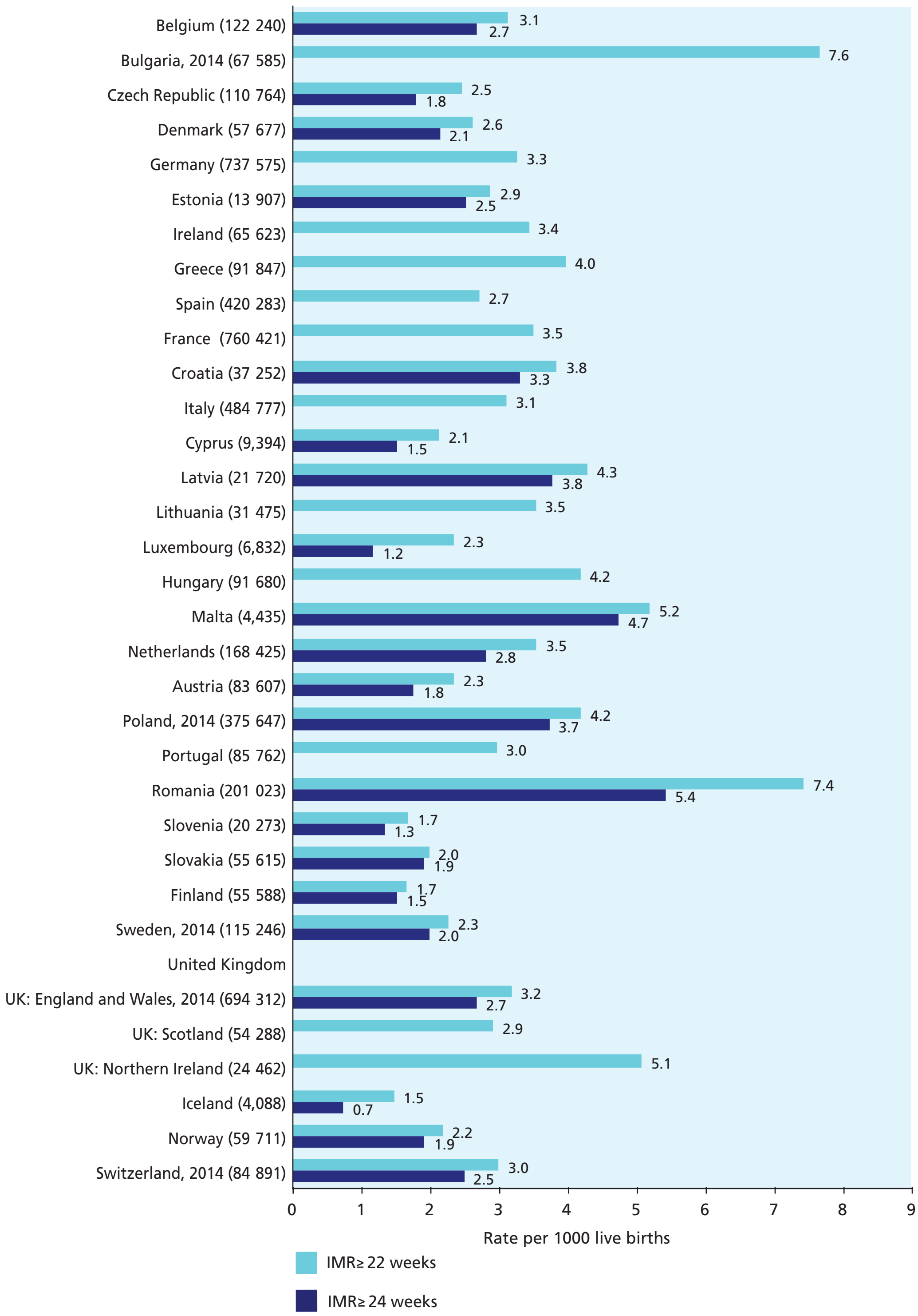
Figure C3.1 Infant mortality rates at and after 22 weeks of gestation in 2015



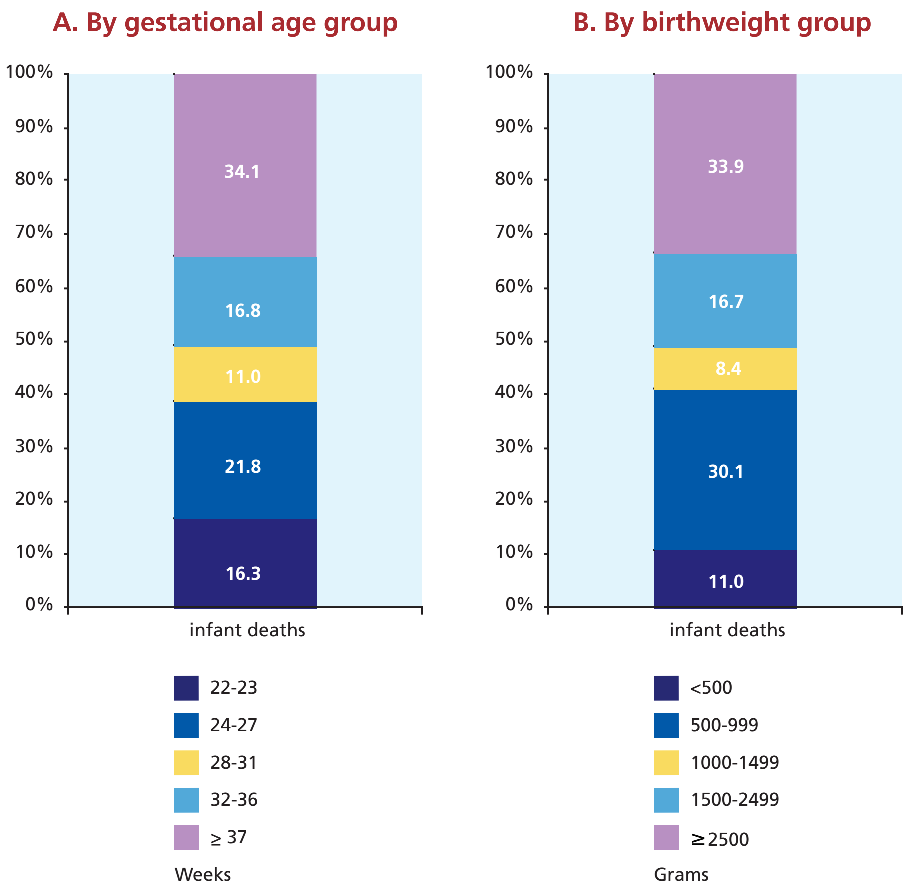
Note: Data are cohort data when available (Belgium, Denmark, Estonia, Croatia, Cyprus, Latvia, Malta, Austria, Slovenia, Finland, Northern Ireland, Iceland, Norway, England and Wales, and Switzerland) or annual rates when cohort data were not provided (Bulgaria, Czech Republic, Germany, Ireland, Greece, Spain, France, Italy, Lithuania, Luxembourg, Hungary, Netherlands, Poland, Portugal, Romania, Slovakia, and Sweden) and for Scotland due to incomplete reporting for cohort deaths. The total number of live births is given in parentheses after country name; data from Bulgaria, Poland, Sweden, and Switzerland are from 2014.

Figure C3.2 Infant mortality at and after 22 and 24 weeks in 2015



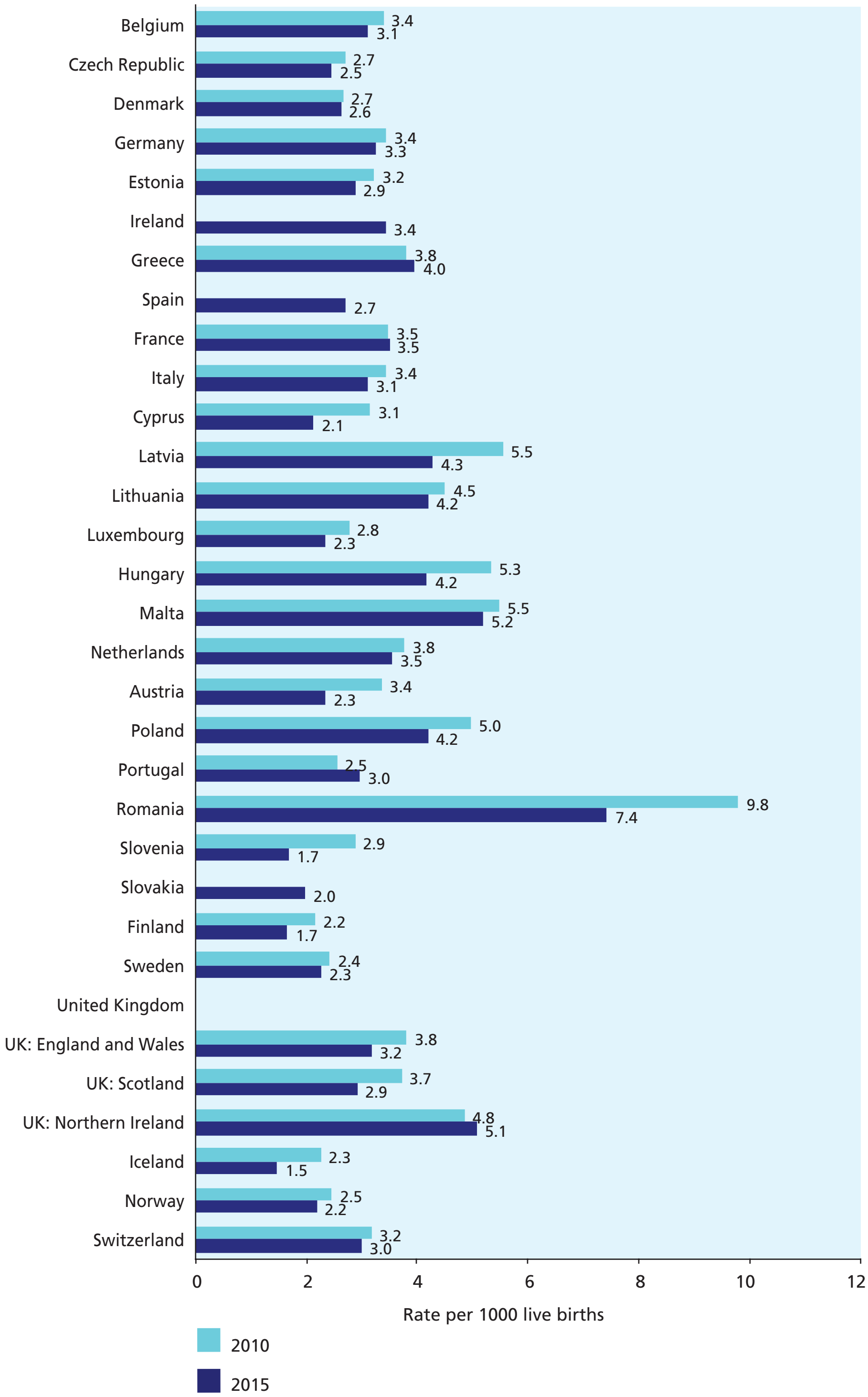
NOTE: Data are cohort data when available (Belgium, Denmark, Estonia, Croatia, Cyprus, Latvia, Malta, Austria, Slovenia, Finland, Northern Ireland, Iceland, Norway, England and Wales, and Switzerland) or annual rates when cohort data were not available (Bulgaria, Czech Republic, Germany, Ireland, Greece, Spain, France, Italy, Lithuania, Luxembourg, Hungary, Netherlands, Poland, Portugal, Romania, Scotland, Slovakia, and Sweden).

Figure C3.3 **Distribution of infant deaths by gestational age (A) and by birth weight (B) for all births at or after 22 weeks of gestation for all countries contributing data in 2015**



NOTES: Calculated for 22 countries (by gestational age) and 21 countries (by birth weight), representing about 2.4 million births.

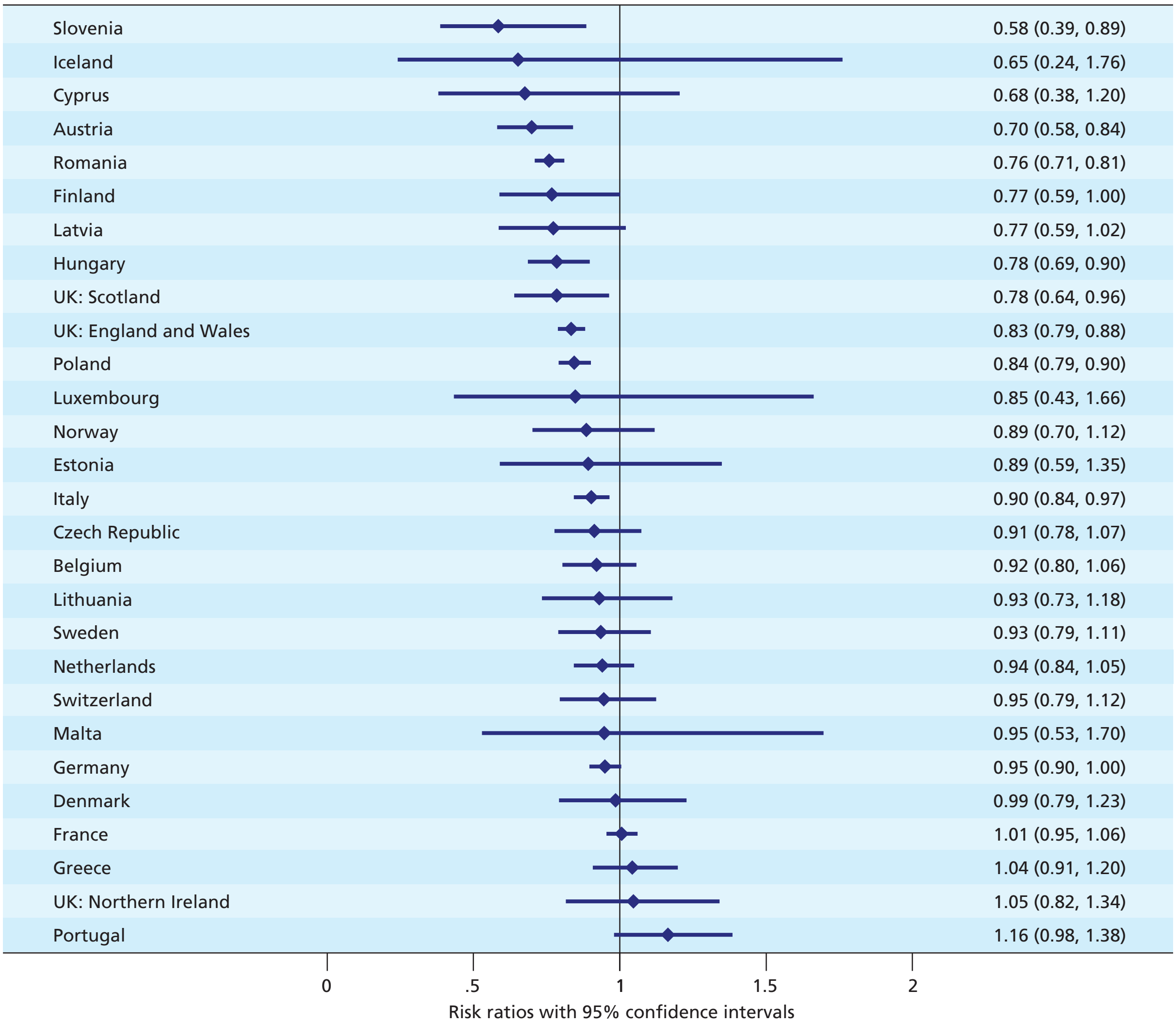
C3.4 Infant mortality rates at and after 22 weeks of gestation in 2010 and 2015



NOTE: First-period data not from 2010: Cyprus 2007.

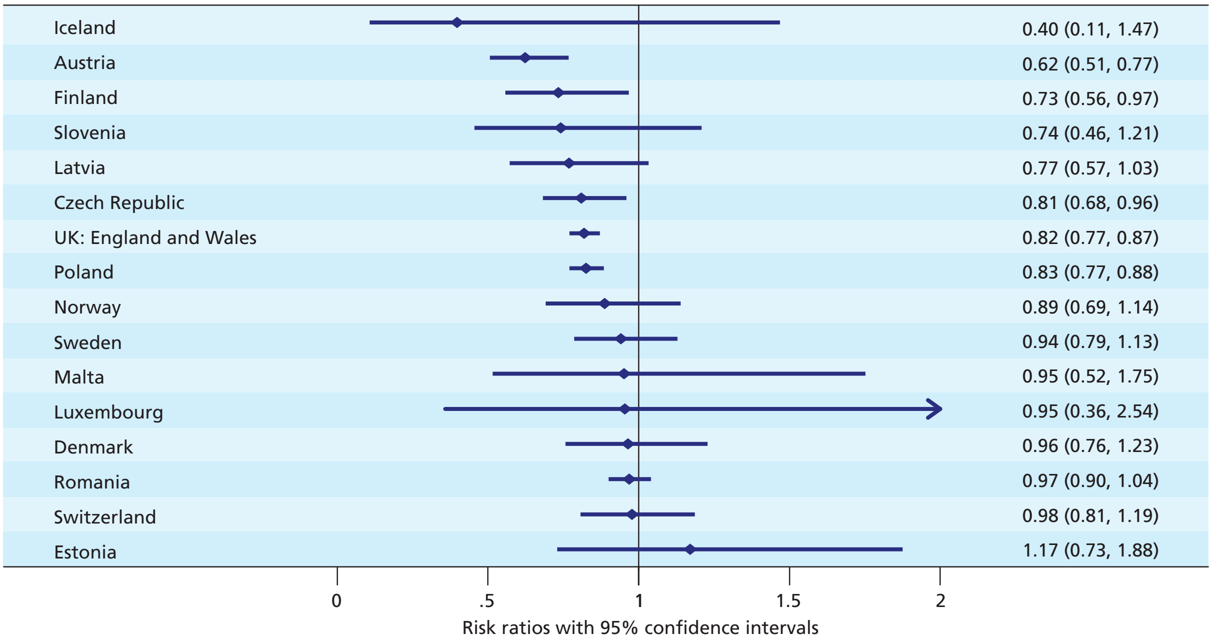
Second-period data not from 2015: Bulgaria 2014, Poland 2014, Sweden 2014, Switzerland 2014, UK: England and Wales 2014.

C3.5 Comparison of infant mortality rates at and after 22 weeks of gestation, 2010 and 2015 (risk ratios and 95% confidence intervals)



NOTE: Pooled random effect estimate: 0.88 (95% CI: 0.84-0.93).
I^2 = 71.5% Chi squared test for heterogeneity: 94.70 (d.f. = 27), p <0.000.
First-period data not from 2010: Greece 2009, Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Poland 2014, Sweden 2014, UK: England and Wales 2014 and Switzerland 2014.

Figure C3.6 **Comparison of infant mortality rates at and after 24 weeks of gestation, 2010 and 2015 (risk ratios and 95% confidence intervals)**



NOTE: Data from Czech Republic and Romania corrected for missing observations.
Pooled random effects estimate: 0.84 (95% CI: 0.78-0.90).
I^2 = 55.3% Chi squared test for heterogeneity= 33.56 (d.f. = 15), p= 0.004.
First-period data not from 2010: Greece 2009, Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Poland 2014, Sweden 2014, Switzerland 2014, UK: England and Wales 2014.

C4. DISTRIBUTION OF BIRTH WEIGHT

JUSTIFICATION

The proportion of low-birthweight babies, defined as those weighing less than 2500 grams at birth, is a widely used indicator for assessing their risk of adverse perinatal outcomes. Babies with a low birth weight are at higher risk of poor perinatal outcome and of long-term cognitive and motor impairments than babies with higher birth weights.[1, 2] Babies with very low birth weights, weighing less than 1500 grams, face the highest short- and long-term risks.[3] Birth weight is included in many national and international data systems and it is therefore possible to compare the percentage of babies with low birth weight over diverse geographic areas and to assess trends over time.

Infants with low birth weight include those born preterm (see C5) as well as children with fetal growth restriction, regardless of their gestational age at delivery. As with preterm births, low birth weight is more common among multiple births than singletons (see C7). Growth restriction is associated with many adverse perinatal health outcomes and short- and long-term impairments, including risks of high blood pressure, ischemic heart diseases, other cardiovascular diseases, diabetes, and metabolic syndromes in adulthood.[4, 5]

Some maternal and fetal characteristics are known risk factors for both preterm birth and growth restriction. Mothers with pre-existing conditions, chronic diseases, and known pregnancy-related disease, such as preeclampsia, are at higher risk, as are fetuses with congenital anomalies and pregnancies with reduced uteroplacental flow. Maternal smoking and low socioeconomic status also contribute significantly to preterm birth and fetal growth impairment.[6] Management of fetal growth restriction during pregnancy involves monitoring the fetus and, if needed, carrying out an indicated early delivery.[7]

On the other side of the birthweight spectrum, macrosomia, usually defined as a high birth weight of 4500 grams and over, is also associated with pregnancy complications and adverse perinatal health outcomes, including shoulder dystocia, neonatal morbidity, and caesarean delivery.[8, 9] Mothers with diabetes are known to be at higher risk of having a macrosomic fetus. The risk of diabetes is also related to a higher proportion of older mothers in many countries.

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

Wide availability of the distribution of birth weight across countries and in international databases provides information about the percentages of infants at risk of mortality and morbidity. One of the advantages of this indicator is that it is more easily measured than gestational age (see C5) in various high and low income settings. Nonetheless, because the distribution of birth weight in a given country reflects both the distribution of gestational age and the pattern of fetal growth, differences between countries are harder to interpret.
To eliminate the impact of varying gestational age at birth, the percentage of newborns who are small-for-gestational-age or large-for gestational-age may be used to investigate fetal growth. No consensus currently exists, however, on international standards for determining birth weight percentiles across European populations. The debate centres on whether all countries should use one global standard or construct their own national references.[10] This is an important area for future research in Europe, as growth restriction is a major perinatal health concern, and we lack tools for monitoring its prevalence and trends over times, especially between countries.

DEFINITION AND PRESENTATION OF INDICATOR

This indicator is defined as the number of births within a given birth weight interval, expressed as a proportion of all registered live births and stillbirths. It is computed by vital status at birth, gestational age, and plurality. The indicators selected for inclusion in this summary are live births weighing less than 1500 and 2500 grams. Indicators presented by pregnancy type (multiples versus singletons) can be found in the summary tables in Appendix B. We focus on live births because their registration is more homogenous in Europe than that of stillbirths, so that this indicator will be more useful for comparisons (see C1).

DATA SOURCES AND AVAILABILITY OF INDICATOR IN EUROPEAN COUNTRIES

This indicator was available in all countries. Data on the birth weight distribution in France are now derived from hospital discharge data, but for comparisons we use data from the French perinatal survey, which were also used in 2010. Cyprus also changed data sources (from a survey to routine collection) between 2010 and 2015.

RESULTS

As Figure C4.1 shows, the prevalence of low-birthweight less than 2500 grams in participating countries ranged from 4.2% to 10.6% of live births, with lower rates in Estonia, Finland, Sweden, Iceland, Latvia, Lithuania, and Norway and higher rates in Romania, Spain, Hungary, Portugal, Greece, Bulgaria, and Cyprus. Very low birth weight under 1500 grams occurred in 0.6% to about 1.4% of live births.

The geographic pattern of the percentage of low-birthweight babies can be seen in Figure C4.2, with the highest percentages of low birth weights (under 2500 grams) in southern and eastern European countries. The lowest percentages of very low birth weight infants, less than 4.5% of live births, were in the Nordic and Baltic countries. Figure C4.3 shows a geographic pattern of high birth weight symmetric to that of low birth weight: the highest percentages of high birth weight (4500 grams or more) were found in the Nordic and Baltic countries, and the lowest percentages in southern Europe, especially in Greece and Cyprus, both countries where these rare high birth weights account for only 0.2% of live births.

Between 2010 and 2015, some countries experienced moderate but significant relative reductions in their percentages of low birth weight babies, ranging from 2% to not quite 5%, as shown in Figures C4.4 and C4.5; these countries included Malta, Norway, Austria, and Slovakia. Other countries experienced increases of a similar magnitude (Spain, Poland, Italy, Scotland, and Portugal). Increases of 5% or more over percentages in 2010 were observed in Iceland, France, Ireland, and Northern Ireland. When all participating countries were considered together, there was no common trend over time – the pooled risk ratio is estimated at 1.00 – and high heterogeneity was observed in the risk ratios from country to country.

KEY POINTS

- The percentage of low birth weight in participating countries varies by a factor of two; some of this reflects differences in preterm birth, as shown by some patterns in common with rates of preterm birth.
- This indicator shows marked geographical variation that may reflect physiological differences in birth weight; these should be taken into consideration when interpreting between-country differences.
- Given the perinatal and long-term health impacts of suboptimal fetal growth, research is needed on how best to measure and compare fetal growth restriction throughout the countries of Europe.

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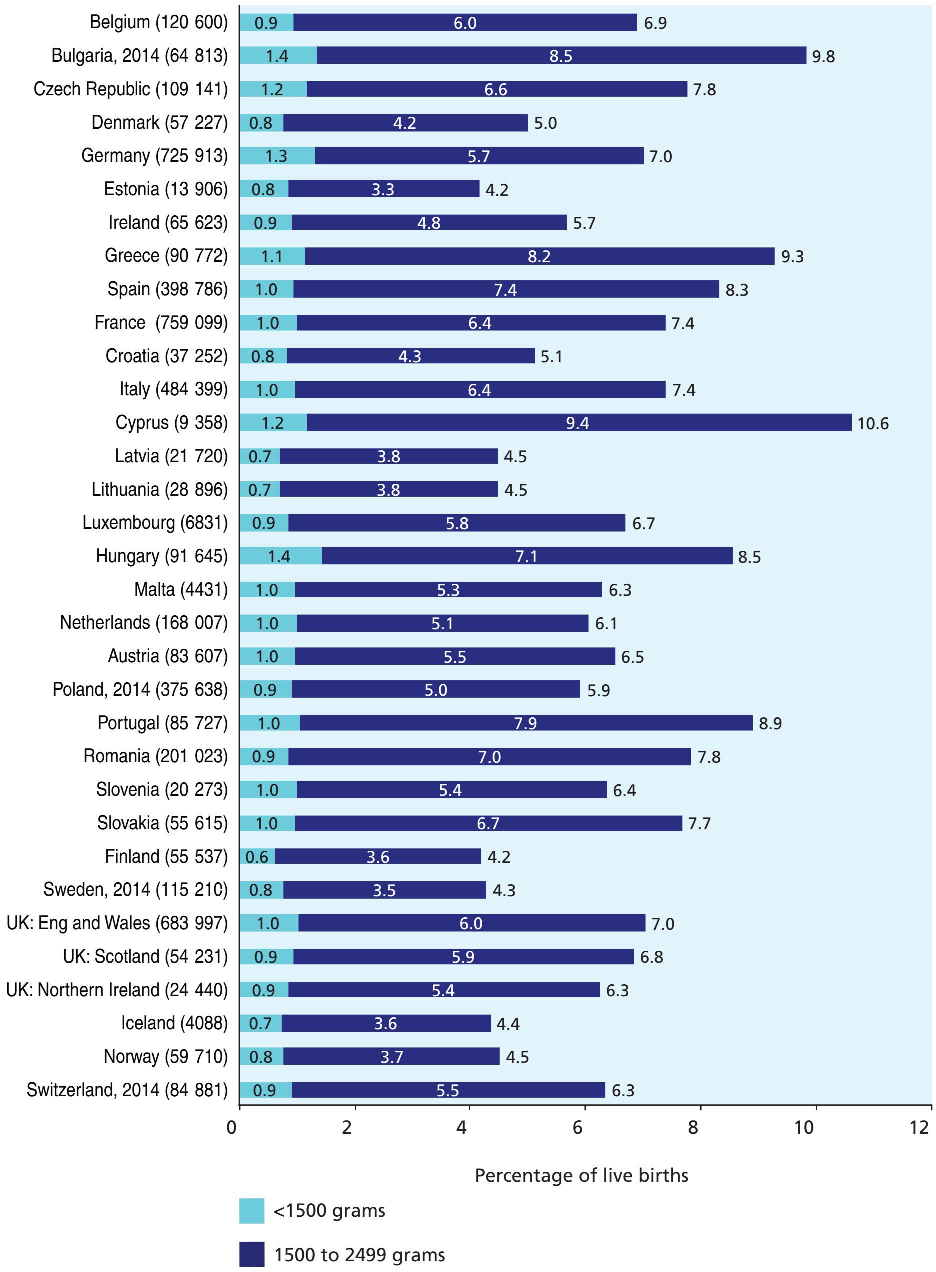
Figure C4.1 Percentage of live births with birth weights < 1500 grams and 1500-2499 grams



NOTE: Number of live births with data on birth weight in parentheses after country name

Figure C4.2 Geographical distribution of the percentage of birth weight < 2500 grams among live births in participating countries

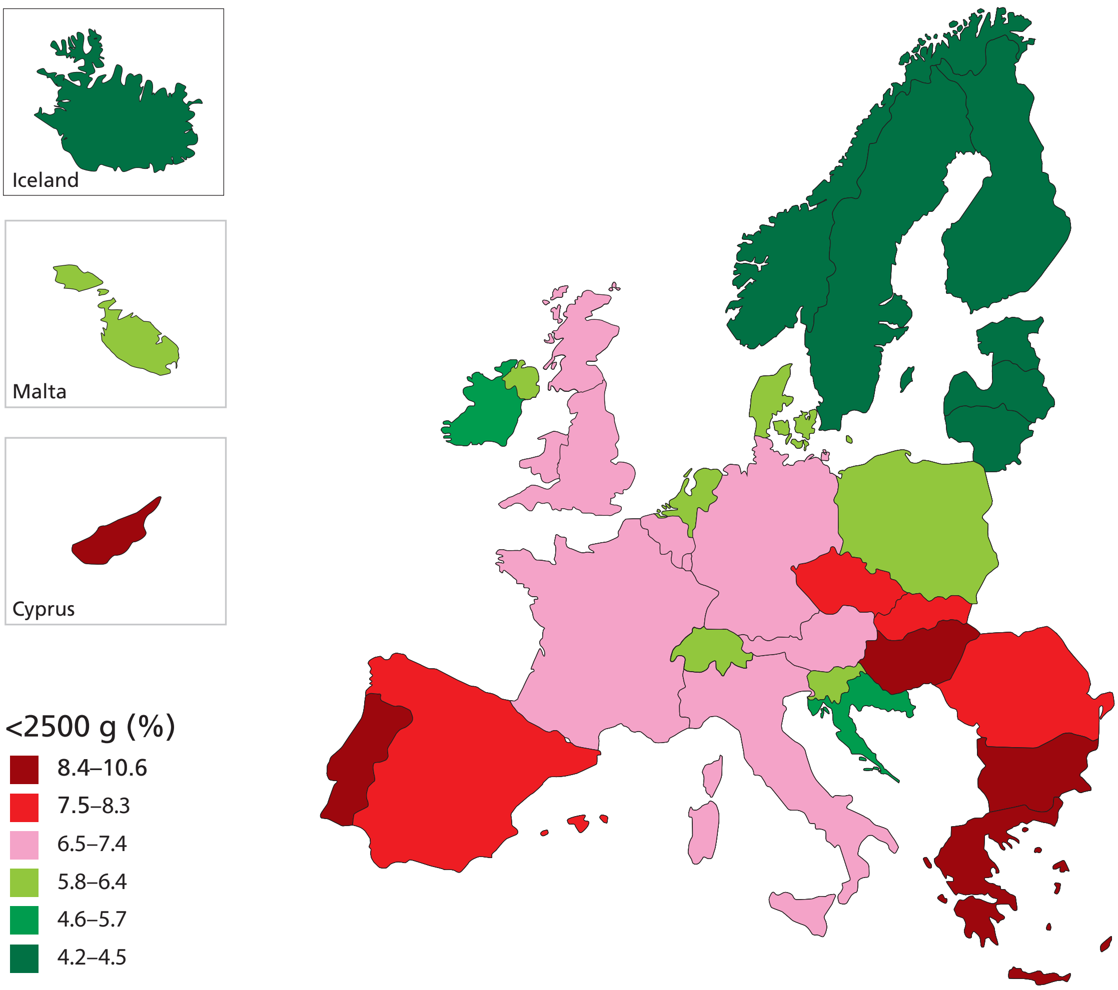


Figure C4.3 **Geographical distribution of the percentage of birth weight ≥ 4500 grams among live births in participating countries**

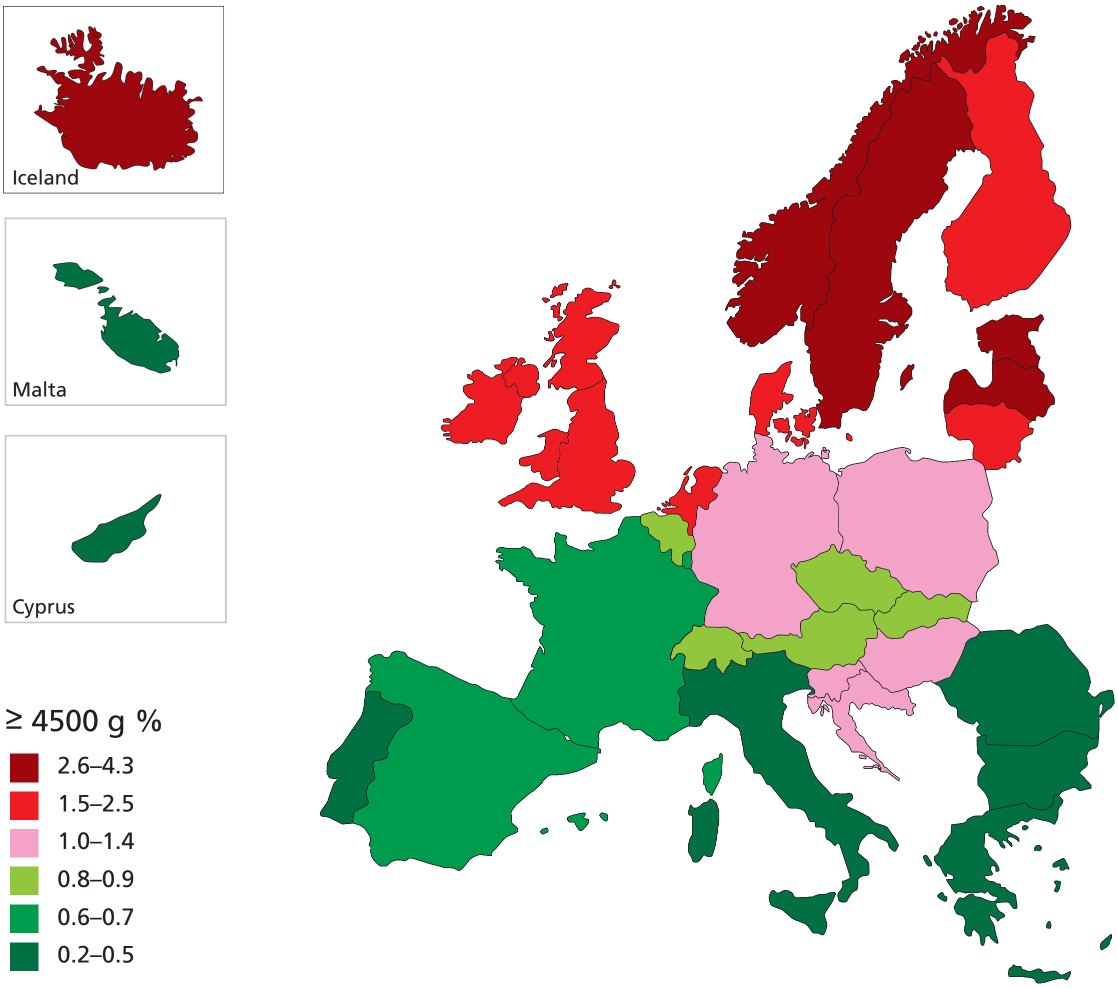
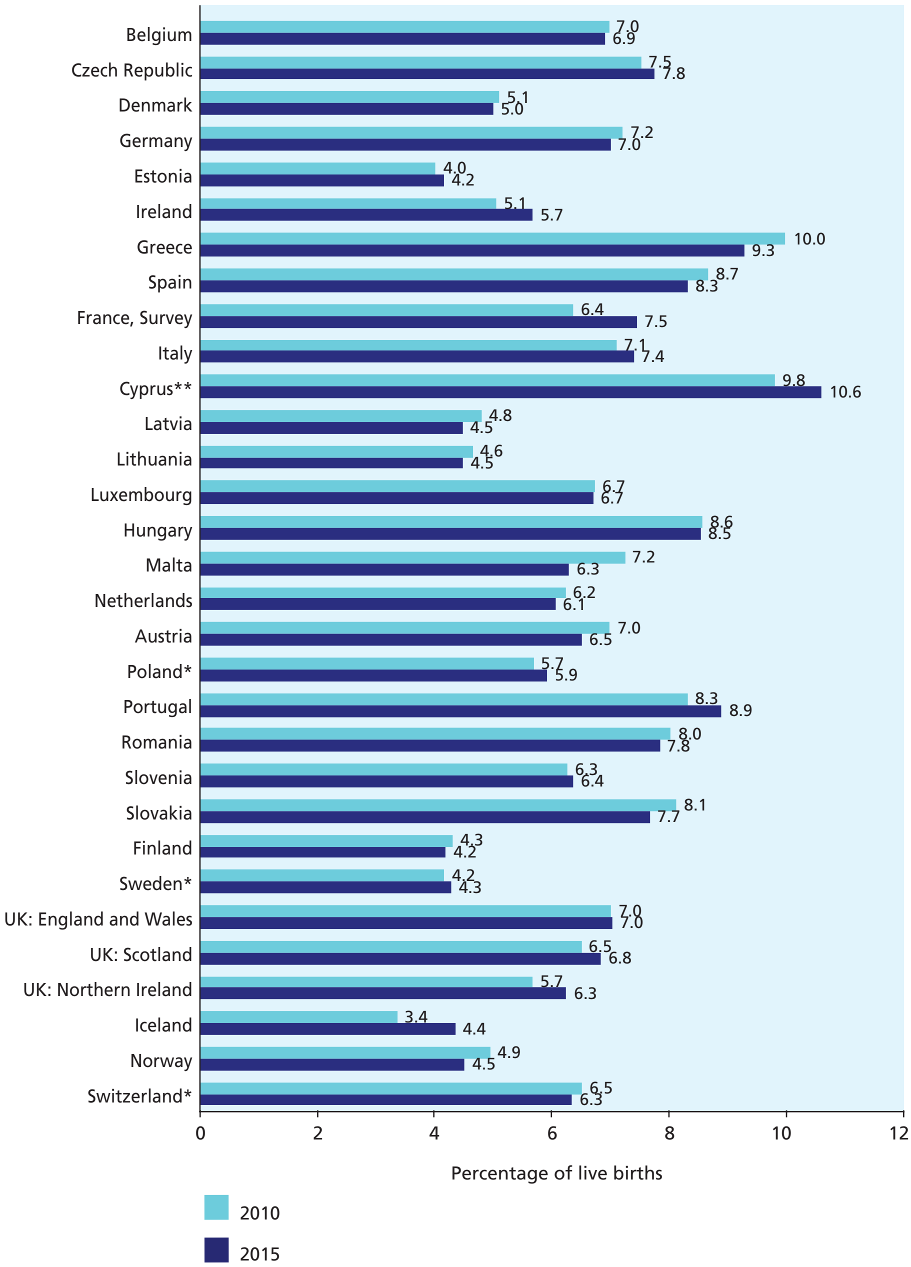
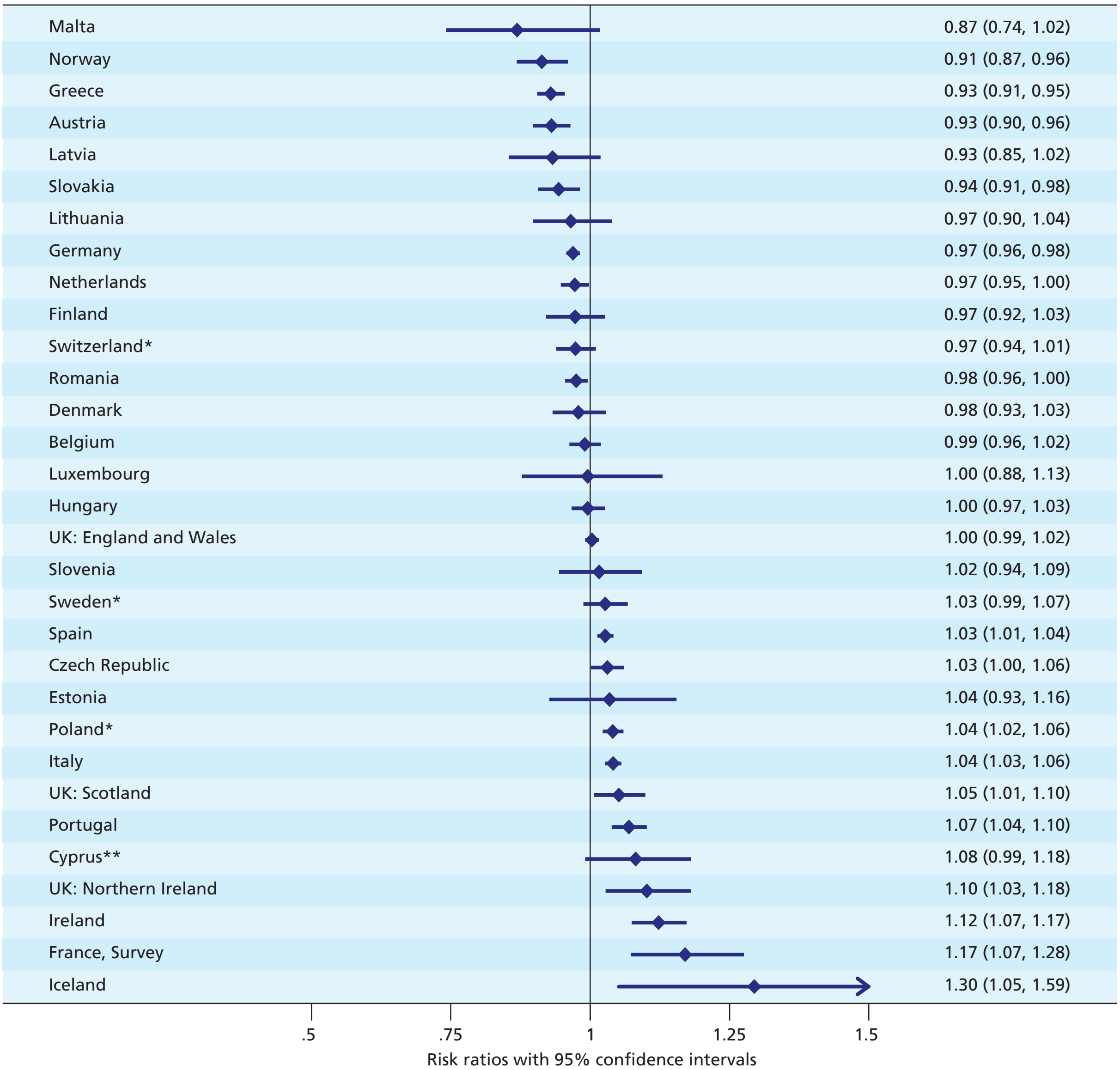


Figure C4.4 Percentage of live births with birth weight < 2500 grams in 2010 and 2015



NOTES: *Second-period data not from 2015: Poland 2014, Sweden 2014, Switzerland 2014.
**First-period data not from 2010: Cyprus 2007.

Figure C4.5 Comparison of percentages of live births with birth weight < 2500 grams, 2010 and 2015 (risk ratios and 95% confidence intervals)



NOTE: Random effects estimate of pooled RR: 1.00 (95% CI: 0.99, 1.02).
I^2=89.4% Chi squared test of heterogeneity: 258.90 (d.f. = 30), p = <0.001.
First-period data not from 2010: Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Poland 2014, Sweden 2014, Switzerland 2014.

C5 DISTRIBUTION OF GESTATIONAL AGE

JUSTIFICATION

Preterm newborns, born before 37 completed weeks of gestation, are at higher risk of mortality, morbidity, and impaired motor and cognitive development in childhood than infants born at term.[1] In high-income countries, about three quarters of all neonatal deaths occur to the 6% to 12% of infants born before 37 weeks.[2] Preterm birth predisposes children to higher risks of chronic diseases and mortality later in life.

Health and developmental risks increase with decreasing gestational age, and very preterm babies born before 32 weeks of gestation are the most vulnerable, with rates of infant mortality between 10% and 15% and of cerebral palsy between 5% and 10%.[1] However, babies with moderate or late preterm births (32 to 36 weeks of gestation) also have worse health and developmental outcomes than term babies.[3, 4]

Preterm births follow spontaneous preterm labour or premature rupture of membranes in about two thirds of cases.[5, 6] Indicated preterm births occur in about one-third of cases and result from a medical decision when there are fetal complications, such as fetal growth restriction, or maternal complications, such as severe preeclampsia.[6] Clinical risk factors for preterm birth include previous preterm birth, infection, inflammation, hypertensive and vascular disorders, diabetes, a shortened cervix, and placentation disorders. In many cases, however, the cause of the preterm birth remains unknown.[5]

Although the survival of preterm infants has improved markedly over recent decades due to medical advances in neonatal care, progress in the prevention of preterm birth has been limited.[7] A WHO survey published in 2012 suggested that globally preterm births may be rising,[8] but within Europe, countries report heterogeneous trends.[9] Population factors related to risks of preterm birth include the incidence of multiple pregnancy (see C7), higher maternal age (C8), and both low and high maternal body mass index (R12).[10] Evidence also suggests that practices related to indicated delivery and obstetric intervention within countries affect variations in the preterm birth rate. There is mounting evidence that targeting population-based social and environmental determinants of early delivery such as stress, air pollution, smoking, and education, could inform new paradigms for prevention.[10, 11]

While most research on gestational age distribution has focused on preterm births, which are at highest risk, early term birth at 37-38 weeks and post-term birth (42+ weeks) also confer additional risks compared with full term birth (39 to 41 weeks).[12] In many countries, policies to induce delivery before 42 weeks have led to declines in the post-term birth rate, although there are substantial variations.[13]

DEFINITION AND PRESENTATION OF INDICATOR

This indicator is defined as the number of live births and fetal deaths at each completed week of gestation (starting from 22 weeks), expressed as a proportion of all live births and stillbirths. The gestational age distribution is presented as follows: 22-36 weeks of gestation (preterm births); 37-38 (early term), 39-41 weeks (full term births); 42 or more weeks (post-term). Preterm births can be subdivided as 22-27 weeks (extremely preterm), 28-31 weeks (very preterm), and 32-36 weeks (moderate and late preterm combined). This indicator is calculated by vital status at birth and plurality.

The summary indicators presented below are calculated for live births. We focus on live births because their registration is more homogenous in Europe than that of stillbirths; they therefore provide a more comparable indicator (for a discussion of this issue, see C1). The complete distribution of gestational age for total births is provided in the summary tables in Appendix B.

DATA SOURCES AND AVAILABILITY OF INDICATOR IN EUROPEAN COUNTRIES

This indicator is available in all participating countries. In France, national data are available from hospital discharge data, but comparisons across time are based on a national survey, which was also the data source in 2010. Cyprus also changed data sources between these two periods.

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

Euro-Peristat requests data on gestational age based on the *best obstetrical estimate*, which combines clinical and ultrasound data. However, we do not know how this best estimate is derived, and it may vary by country as well as between health providers within countries. Ultrasound is widely used for dating pregnancies in Europe, however, and most women receive care in the first trimester of pregnancy. The method of determining gestational age can influence the reported gestational age distribution; use of ultrasound estimates tends to shift the distribution towards earlier gestations and increase the reported preterm birth rate, although not all studies have found this to be the case.[10] Research about the methods used within Europe for determining gestational age and their impact on the gestational age distribution should be undertaken to better elucidate the comparability of this indicator. An analysis of the Euro-Peristat data showed that for very preterm births, it is preferable to begin comparisons of births from 24 weeks of gestation onward.[14]

RESULTS

As shown in Figure C5.1, the preterm birth rate for live births varied from about 6% to 12% in participating countries. Lower preterm birth rates (below 6.5%) were observed in Norway, Denmark, Latvia, Finland, Estonia, Sweden, Iceland, and Lithuania, and higher rates (at or above 8.5%) in Germany, Greece, Hungary, and Cyprus. Rates were around 8% in Belgium, Romania, Portugal, Austria, England and Wales, Scotland, Italy, Bulgaria, the Czech Republic, Poland, Spain, Slovenia, Northern Ireland, and Luxembourg. Very preterm births, that is, births before 32 weeks of gestational age, accounted for about 1% of live births (range: 0.8 to 1.4%).

Figure C5.2 provides the full gestational age distribution and shows that the extent of variation for early term live births between countries is similar in magnitude to the variation in preterm birth rates. Rates varied by more than two-fold – between 16% and 44%. Rates were lowest (less than or equal to 18%) in Lithuania, Iceland, Latvia, Estonia, and Finland, and highest (above 27%) in Greece, Romania, Italy, Luxembourg, Malta, and Cyprus. Countries with higher early term rates tended also to have higher preterm birth rates.

The percentage of preterm births ranged between 4 and 9% among singletons and from 38 to 70% among multiples (See summary tables C5_B). Similar variations in preterm birth rates between countries were observed for both singleton and multiple births, with the exception of Romania where a relatively high proportion of singleton preterm births was accompanied by a relatively low proportion of multiple preterm births. Conversely, Slovenia had a relatively low proportion of singleton preterm births and a relatively high proportion of multiple preterm births.

Proportions of preterm live births were similar to those in 2010 for many of the countries. Differences between rates in 2010 and 2015 ranged between -0.8 and +1.5 percentage points, as shown in Figure 5.4. Relative changes in the percentages of preterm live births are shown in Figure C5.4, which also provides 95% confidence intervals for these changes. These percentages were more than 5% higher in 2015 than in 2010 in Portugal, England and Wales, Poland, Ireland, France, Cyprus, Scotland, and Iceland. Significant declines were seen in the Netherlands, Austria, the Czech Republic, Spain, Sweden, and Germany. Overall, the pooled estimate of relative change between the two years was 1.02 with a 95% confidence interval from 0.99-1.04.

KEY POINTS

- Gestational age is an essential indicator of perinatal health but is still not currently included in international data sets, although the data are available almost everywhere and should be routinely reported.
- There are wide differences in the percentages of preterm and early term births between European countries. These have been confirmed in other international studies in data from 1996-2010. Heterogeneous patterns of changes in early delivery between 2010 and 2015 raise questions about policies and practices associated with changes and challenge us to rethink current preventive approaches.

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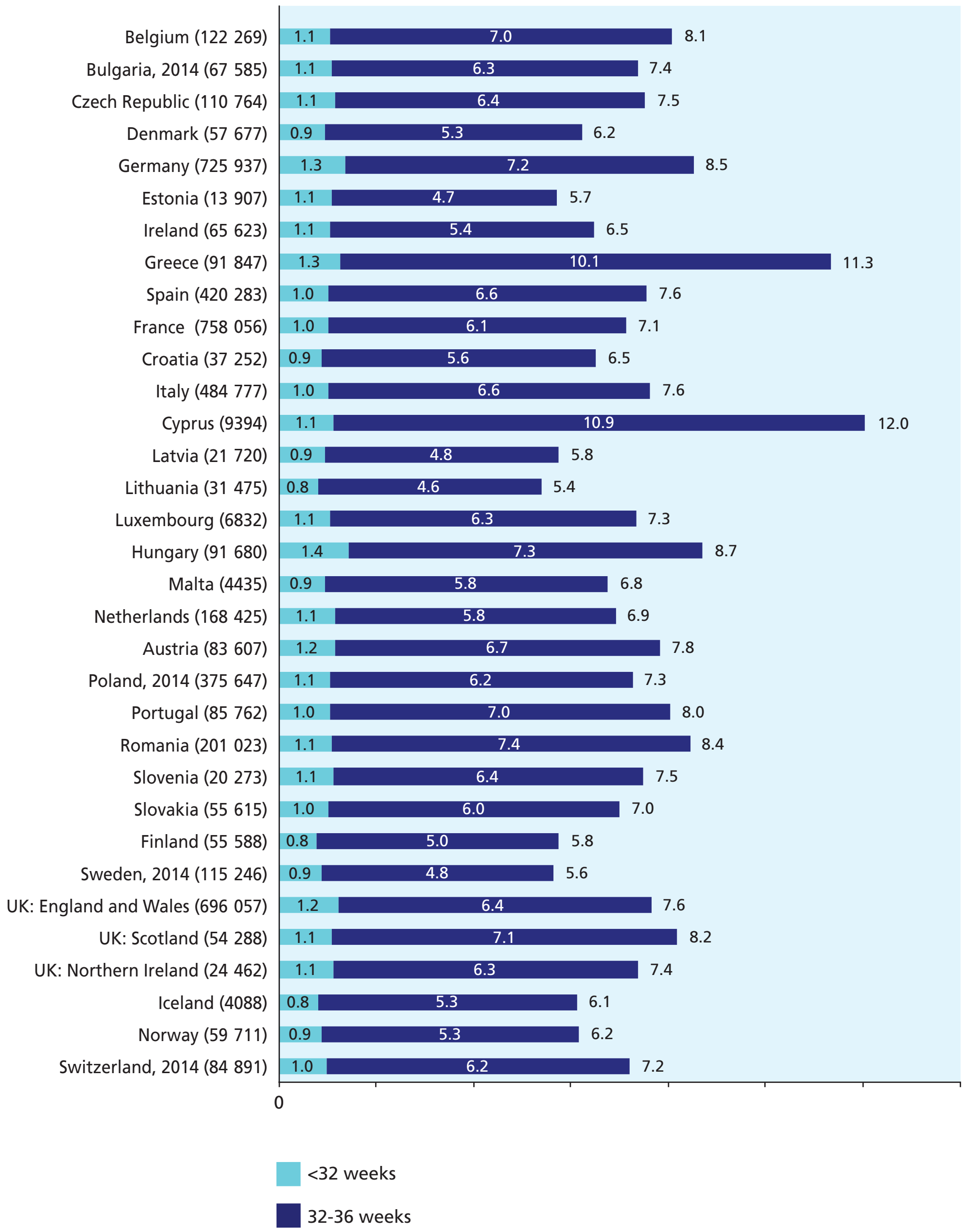
Figure C5.1 Percentages of preterm live births overall and by gestational age (22-31 weeks and 32-36 weeks) in 2015



NOTE: Number of live births with data for gestational age in parentheses after country name

Figure C5.2 Percentages of preterm, early term, full term, and post-term live births in 2015

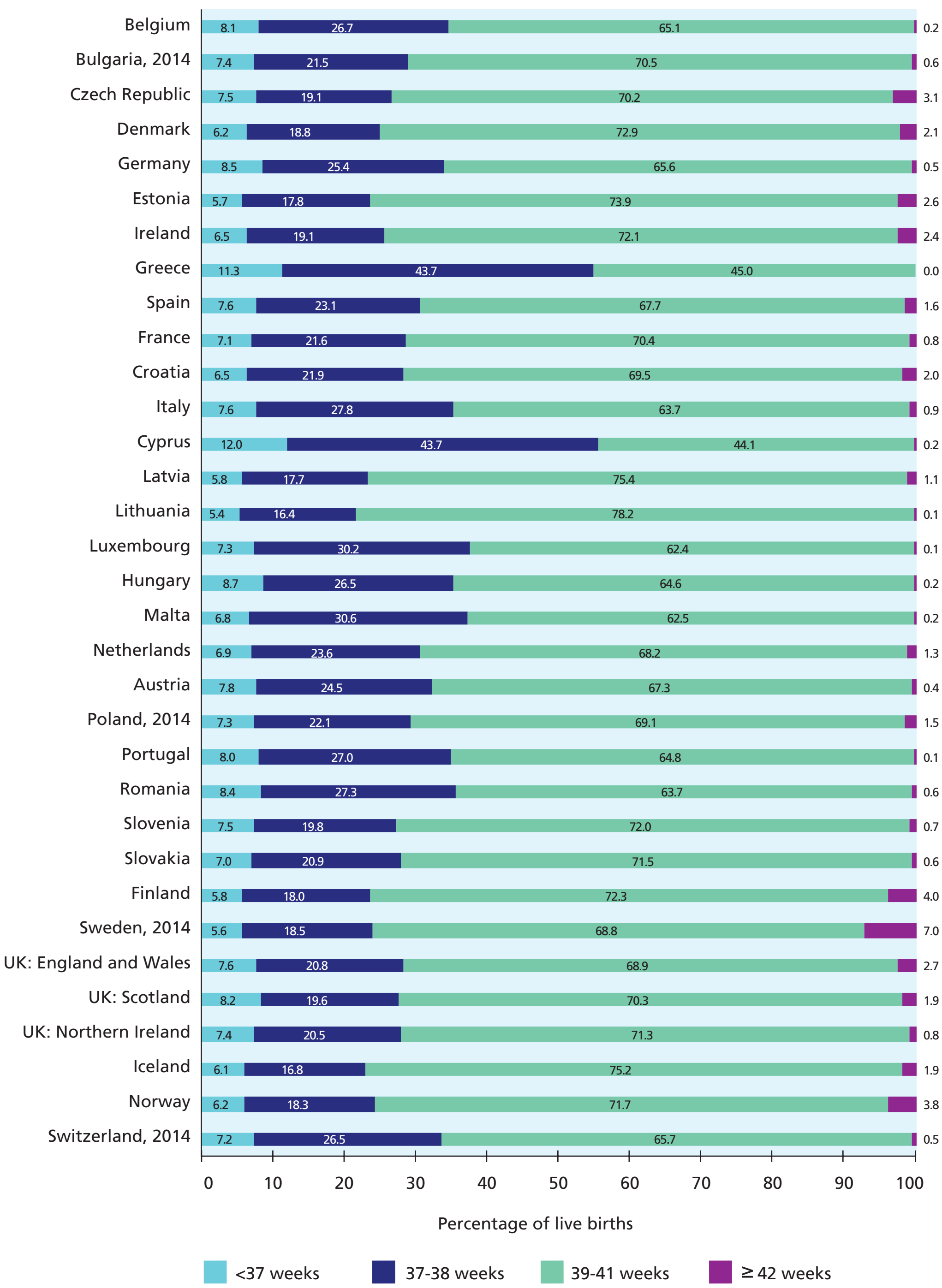


Figure C5.3 Geographical distribution of preterm births among live births in Europe

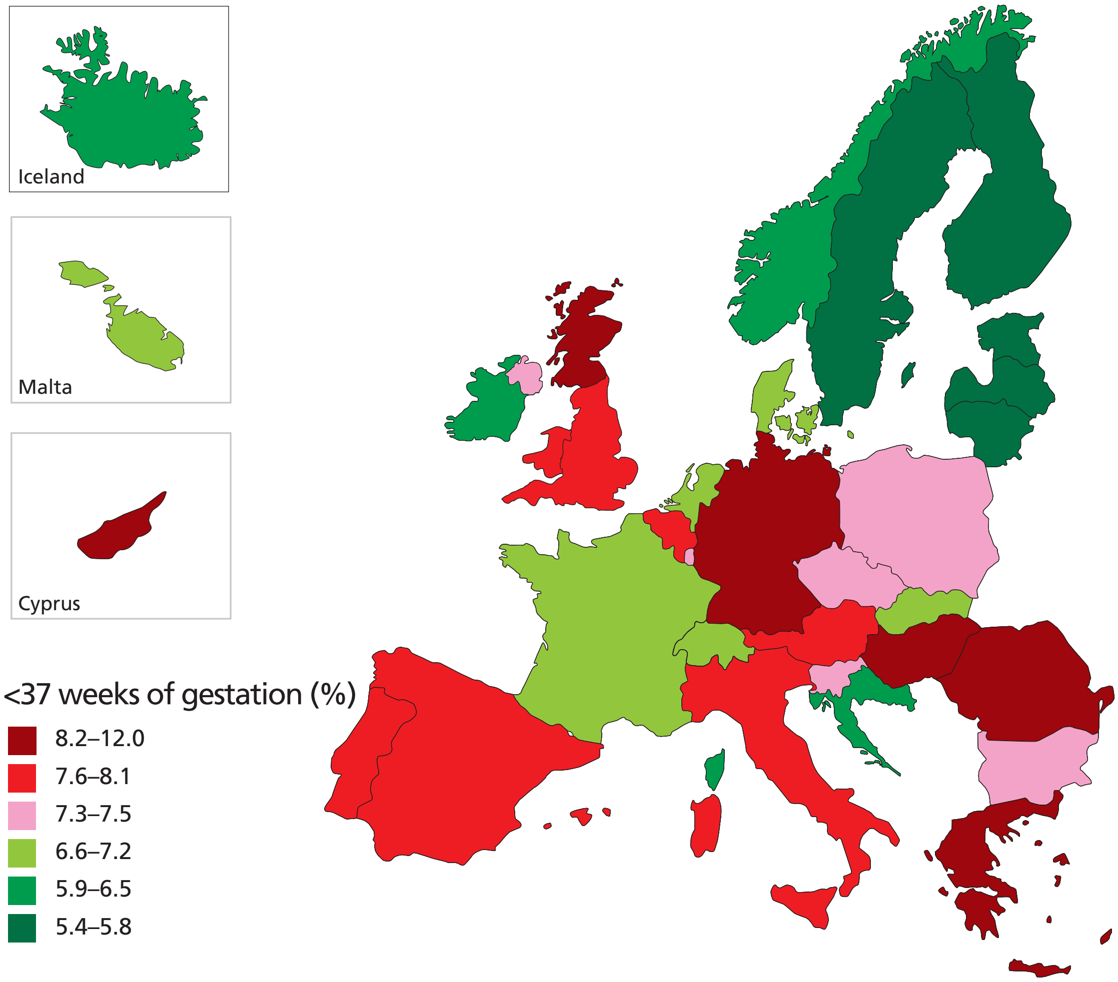
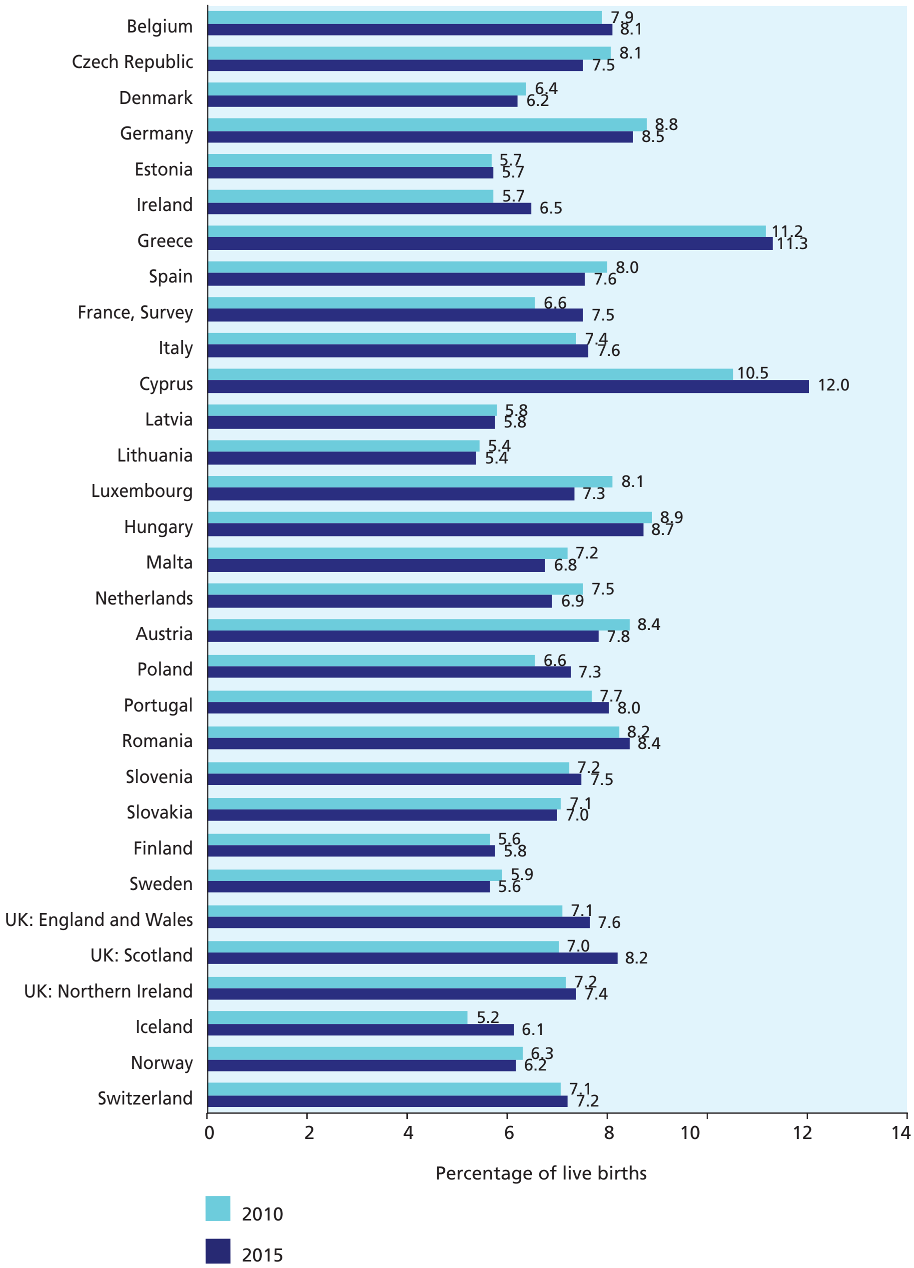
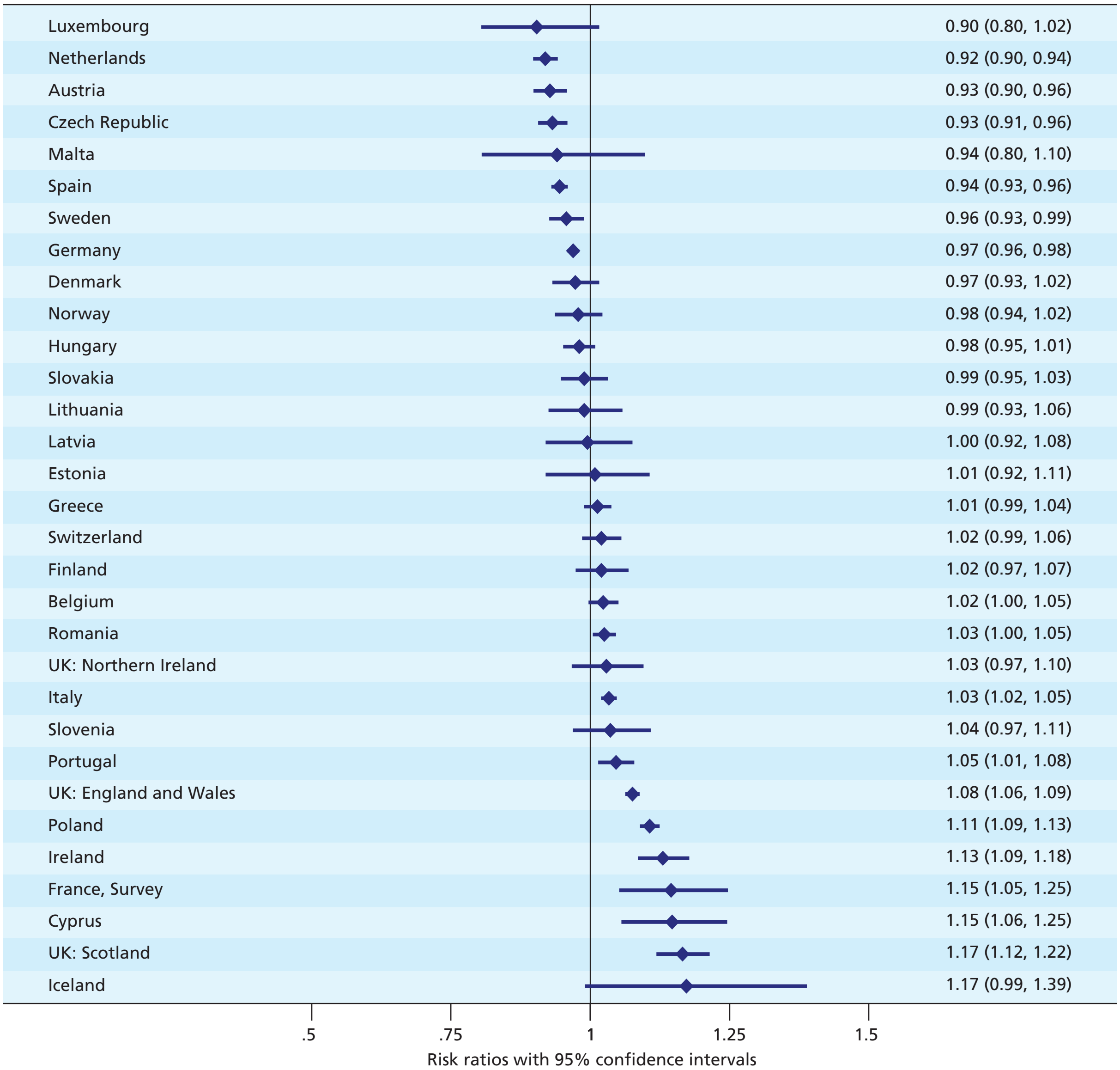


Figure C5.4 Percentages of live preterm births in 2010 and 2015



NOTE: First-period data not from 2010: Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Poland 2014, Sweden 2014,Switzerland 2014.

Figure C5.5 Comparison of live preterm birth rates, 2010 and 2015 (risk ratios and 95% confidence intervals)



NOTE: Pooled random effects estimate: 1.02 (95% CI: 0.99-1.04).
I^2=95.0%, Chi squared tests of heterogeneity: 605.2 (d.f. = 30), p <0.001.
First-period data not from 2010: Cyprus 2007.
Second-period data not from 2015: Bulgaria 2014, Poland 2014, Sweden 2014, Switzerland 2014.

APPENDICES

APPENDIX A:
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APPENDIX B

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CORE INDICATORS

C1_A: Fetal mortality rate by gestational age and birth weight (numbers)

			Number of total births				Number of fetal deaths				Number of terminations				Number of fetal deaths without terminations (if possible)			
Country/ coverage	Source	Inclusion criteria for fetal deaths	All*	≥1000 g	≥28 weeks	≥24 weeks	All*	≥1000 g	≥28 weeks	≥24 weeks	All*	≥1000 g	≥28 weeks	≥24 weeks	All*	≥1000 g	≥28 weeks	≥24 weeks
Belgium	1	500+ grams. if BW unknown, 22+ weeks; cannot distinguish terminations	122 838	120 524	120 584	121 109	598	359	368	530					598	359	368	530
Bulgaria (2014)[1]	1,3	a) 800+ grams and / or 26+ weeks of gestation; b) <800 grams and / or <26 weeks - provided that the foetus was born alive and lived at least 3 days	68 122	67 719	67 806	68 047	537	367	388	471	43	0	0	0	494	367	388	471
Czech Republic	1	500+ grams if BW not available 22+ weeks. Cannot distinguish terminations from fetal deaths	111 162	108 962	108 179	108 536	398	274	296	348					398	274	296	348
Denmark	1,2,4	22+ weeks	57 871	57 028	57 558	57 734	194	NA	115	146	24	0	0	0	170	NA	115	146
Germany[2]	1	500+ grams	728 496	723 416	724 006	NA	2559	1630	1759	NA					2559	1630	1759	NA
Estonia	1,3,4	22+ weeks. Terminations register includes pregnancies up to 20 weeks, thus all fetal deaths in Estonia are without terminations	13 961	13 897	13 897	13 948	54	39	43	50	0	0	0	0	54	39	43	50
Ireland	1	24+ weeks or 500+ grams (national criteria), Source 1: 500+ grams only. Induced abortions not included	65 913	65 586	65 627	65 837	290	189	222	273	0	0	0	0	290	189	222	273
Greece	1	22+ weeks	92 159	90 683	91 119	91 447	312	243	270	308					312	243	270	308
Spain	1	180+ days / 500 grams	421 590	398 599	356 157	357 270	1307	897	968	1106					1307	897	968	1106
France	5	22 weeks or 500 grams. Terminations included	764 704	758 775	758 852	762 961	6648	2501	3359	5172	2824	885	1073	2208	3824	1616	2286	2964
France (Survey, 2016)	1	22+ weeks	13 369	13 211	13 217	13 305	137	58	63	102	58	24	23	45	79	34	40	57
Croatia	1	22+ weeks.Terminations not included	37 428	37 234	37 237	37 391	176	112	119	160	0	0	0	0	176	112	119	160
Italy	8	fetal death: 180+ days miscarriage: <180 days	487 042	483 759	482 647	484 213	2265	1067	1175	1442	485	NA	0	6	1780	1067	1175	1436
Cyprus	1	22+ weeks or 500+ grams. Cannot distinguish TOP	9425	9333	9219	9247	31	10	13	17					31	10	13	17
Latvia	3	22+ weeks 500 grams (if BW < 500 g but GA ≥ 22). Induced abortions not included	21 826	21 721	21 728	21 798	106	70	73	86	0	0	0	0	106	70	73	86
Lithuania[1,3]	1,2,3	22+ weeks	31 601	31 483	31 491	31 577	126	84	90	113	0	0	0	0	126	84	90	113
Luxembourg	1	22+ weeks or 500+ grams	6889	6837	6842	6873	57	26	27	43	27	12	11	21	30	14	16	22
Hungary	1	Miscarriage/abortion: <24 weeks or if GA missing, <30 cm or <500 grams. Late fetal death (stillbirth): 24+ weeks, or if GA missing, 30+ cm or 500+ grams, while in case of twin birth at least one of the fetus was born alive	92 253	91 386	91 507	92 002	573	311	338	407	47	NA	0	1	526	311	338	406

Country/ coverage	Source	Inclusion criteria for fetal deaths	Number of total births				Number of fetal deaths				Number of terminations				Number of fetal deaths without terminations (if possible)			
			All*	≥1000 g	≥28 weeks	≥24 weeks	All*	≥1000 g	≥28 weeks	≥24 weeks	All*	≥1000 g	≥28 weeks	≥24 weeks	All*	≥1000 g	≥28 weeks	≥24 weeks
Malta	1,2	22+ weeks - if GA missing 500+ grams	4453	4425	4429	4448	18	8	11	15	0	0	0	0	18	8	11	15
Netherlands	1	Perined registrates all fetal deaths from 16+ weeks. However, for the core indicators: 22+ weeks or – if GA unknown 500+ grams. Induced abortions are included	169 234	167 584	165 475	166 113	809	345	358	482					809	345	358	482
Austria	1	Only stillbirths are included (defined according the WHO definition - 500 grams limit). Terminations not registered	83 884	83 465	83 496	83 788	277	188	202	245	0	0	0	0	277	188	202	245
Poland (2014)	1	500+ grams, if BW unknown 22+ weeks	376 968	375 160	375 283	376 612	1321	887	932	1169	0	0	0	0	1321	887	932	1169
Portugal	1	22+ weeks (equivalent to 500 grams). If GA<24 weeks (equivalent to <500 grams), death certificate is not compulsory unless the mother wants to register it or there is a suspicious of an induced abortion	86 048	85 448	85 587	85 841	286	NA	218	263					286	NA	218	263
Romania	3	Fetal deaths do not include abortions	201 760	201 178	201 298	201 738	737	688	724	734	0	0	0	0	737	688	724	734
Slovenia	1	500+ grams. Induced abortions are included	20 397	20 259	20 271	20 370	124	67	72	108	61	26	24	47	63	41	48	61
Slovakia	1	22+ weeks	55 824	55 610	55 647	55 809	209	192	197	201	0	0	0	0	209	192	197	201
Finland	1	22+ weeks	55 832	55 507	55 481	55 638	244	105	114	141	73	NA	0	3	171	105	114	138
Sweden (2014)	1	22+ weeks. Induced abortions are not included	115 710	115 156	115 206	115 586	464	323	350	423	0	0	0	0	464	323	350	423
United Kingdom	1	22+ weeks					4429	2289	2486	3501	884	204	197	485	3545	2085	2289	3016
UK: England and Wales	2	24+ weeks	699 204	683 190	692 387	695 596	3147	2067	2232	3147	234	110	109	234	2913	1957	2123	2913
UK: Scotland	1	22+ weeks. Fetal deaths at 22+ weeks can be identified from hospital discharge data. In addition fetal deaths at 24+ weeks are registered by law	54 550	54 171	54 033	54 242	262	139	155	208	37	1	2	10	225	138	153	198
UK: Northern Ireland	1	24+ weeks. Terminations cannot be identified from data	24 544	24 420	24 461	24 533	82	56	63	82					82	56	63	82
Iceland	2	Fetal deaths: 22+ weeks. Terminations are not allowed after 22 weeks	4098	4079	4080	4088	10	8	8	8	0	0	0	0	10	8	8	8
Norway	1	22+ weeks or 500+ grams. Induced abortions are not included. Only terminations due to fetal anormaly are recorded	59 931	59 640	59 467	59 668	220	130	136	181	3	0	1	2	217	130	135	179
Switzerland (2014)	1	22+ weeks or >500 grams. If <22 weeks and <500 grams, included only if there is a twin alive	85 263	84 741	84 778	85 099	372	176	209	279	57	7	9	25	315	169	200	254

NOTES: Fetal mortality rate per 1000 total births = ((number of fetal death)/(number of total births))*1000
Euro-Peristat requested data for all births at 22 completed weeks of gestation or with a birth weight of 500 grams if gestational age was missing.
* this includes births with unknown GA 22+ weeks
1. In Bulgaria and Lithuania, all live births with unknown GA (N=2476 for Bulgaria; N=2579 for Lithuania) were considered as live births occurring at 24+ weeks of gestational age and all live births with unknown BW (N=2772 for Bulgaria; N=2579 for Lithuania) were considered as live births occurring at 1000+ grams.
2. In Germany, 124 fetal deaths among 869 infants with birth weight below 500 g were documented in the database.
3. In Lithuania, all stillbirths with unknown GA N=3 were considered stillbirths occurring at 24+ weeks of gestational age and all stillbirths with unknown BW N=3 were considered stillbirths occurring at 1000+ grams.

C1_B: Fetal mortality rate by gestational age and birth weight (rates per 1000 total births)

		Fetal mortality rate per 1000 total births (without terminations, if possible)				Fetal mortality rate per 1000 total births			
Country/coverage	Source	All*	≥1000 g	≥28 weeks	≥24 weeks	All*	≥1000 g	≥28 weeks	≥24 weeks
Belgium	1	4.9	3.0	3.1	4.4	4.9	3.0	3.1	4.4
Bulgaria[1]	1,3	7.3	5.4	5.7	6.9	7.9	5.4	5.7	6.9
Czech Republic	1	3.6	2.5	2.7	3.2	3.6	2.5	2.7	3.2
Denmark	1,2,4	2.9	NA	2.0	2.5	3.4	NA	2.0	2.5
Germany	1	3.5	2.3	2.4	3.1	3.5	2.3	2.4	3.1
Estonia	1,3,4	3.9	2.8	3.1	3.6	3.9	2.8	3.1	3.6
Ireland	1	4.4	2.9	3.4	4.1	4.4	2.9	3.4	4.1
Greece	1	3.4	2.7	3.0	3.4	3.4	2.7	3.0	3.4
Spain	1	3.1	2.3	2.7	3.1	3.1	2.3	2.7	3.1
France	5	5.0	2.1	3.0	3.9	8.7	3.3	4.4	6.8
France (Survey, 2016)	1	5.9	2.6	3.0	4.3	10.2	4.4	4.8	7.7
Croatia	1	4.7	3.0	3.2	4.3	4.7	3.0	3.2	4.3
Italy	8	3.7	2.2	2.4	3.0	4.7	2.2	2.4	3.0
Cyprus	1	3.3	1.1	1.4	1.8	3.3	1.1	1.4	1.8
Latvia	3	4.9	3.2	3.4	3.9	4.9	3.2	3.4	3.9
Lithuania[1]	1,2,3	4.0	2.7	2.9	3.6	4.0	2.7	2.9	3.6
Luxembourg	1	4.4	2.0	2.3	3.2	8.3	3.8	3.9	6.3
Hungary	1	5.7	3.4	3.7	4.4	6.2	3.4	3.7	4.4
Malta	1,2	4.0	1.8	2.5	3.4	4.0	1.8	2.5	3.4
Netherlands	1	4.8	2.1	2.2	2.9	4.8	2.1	2.2	2.9
Austria	1	3.3	2.3	2.4	2.9	3.3	2.3	2.4	2.9
Poland	1	3.5	2.4	2.5	3.1	3.5	2.4	2.5	3.1
Portugal	1	3.3	NA	2.5	3.1	3.3	NA	2.5	3.1
Romania	3	3.7	3.4	3.6	3.6	3.7	3.4	3.6	3.6
Slovenia	1	3.1	2.0	2.4	3.0	6.1	3.3	3.6	5.3
Slovakia	1	3.7	3.5	3.5	3.6	3.7	3.5	3.5	3.6
Finland	1	3.1	1.9	2.1	2.5	4.4	1.9	2.1	2.5
Sweden	1	4.0	2.8	3.0	3.7	4.0	2.8	3.0	3.7
United Kingdom									
UK: England and Wales	2	4.2	2.9	3.1	4.2	4.5	3.0	3.2	4.5
UK: Scotland	1	4.1	2.5	2.8	3.7	4.8	2.6	2.9	3.8
UK: Northern Ireland	1	3.3	2.3	2.6	3.3	3.3	2.3	2.6	3.3
Iceland	2	2.4	2.0	2.0	2.0	2.4	2.0	2.0	2.0
Norway	1	3.6	2.2	2.3	3.0	3.7	2.2	2.3	3.0
Switzerland	1	3.7	2.0	2.4	3.0	4.4	2.1	2.5	3.3

NOTES: Fetal mortality rate per 1000 total births = ((number of fetal death)/(number of total births))*1000
Euro-Peristat requested data for all births at 22 completed weeks of gestation or with a birth weight of 500 grams if gestational age was missing.
In Germany, 124 fetal deaths among 869 infants with birthweight below 500 g were documented in the database
* this includes births with unknown GA 22+ weeks
1: In Bulgaria and Lithuania, all live births with unknown GA (N=2476 for Bulgaria; N=2579 for Lithuania) were considered as live births occurring at 24+ weeks of gestational age and all live births with unknown BW (N=2772 for Bulgaria; N=2579 for Lithuania) were considered as live births occurring at 1000+ grams

C2_A: Neonatal mortality rate (numbers and rates per 1000 live births)

Country/coverage	Source	Number of live births*	Annual deaths: Number of neonatal deaths All (day 0-27)	Early (day 0-6	Late (day 7-27)	Annual deaths: Neonatal mortality rate per 1000 live births All (day 0-27)	Early[1] (day 0-6)	Late[2] (day 7-27)	Source	Cohort deaths: Number of neonatal deaths All (day 0-27)	Early (day 0-6)	Late (day 7-27)	Cohort deaths: Neonatal mortality rate per 1000 live births All (day 0-27)	Early[3] (day 0-6)	Late[4] (day 7-27)*
Belgium		122 240	NA	NA	NA	NA	NA	NA	1	254	194	60	2.1	1.6	0.5
Bulgaria (2014)	1	67 585	298	211	87	4.4	3.1	1.3		NA	NA	NA	NA	NA	NA
Czech Republic	1	110 764	165	106	59	1.5	1.0	0.5		NA	NA	NA	NA	NA	NA
Denmark		57 677	NA	NA	NA	NA	NA	NA	1,2,4	109	89	20	1.9	1.5	0.3
Germany	2	737 575	1700	1352	348	2.3	1.8	0.5		NA	NA	NA	NA	NA	NA
Estonia	1,3	13 907	21	16	5	1.5	1.2	0.4	1,3	21	16	5	1.5	1.2	0.4
Ireland[5]		65 623	NA	NA	NA	NA	NA	NA	1	NA	178	NA	NA	2.7	NA
Greece	1	91 847	260	179	81	2.8	1.9	0.9		NA	NA	NA	NA	NA	NA
Spain	1	420 283	771	519	252	1.8	1.2	0.6		NA	NA	NA	NA	NA	NA
France	2,3	760 421	1860	1285	575	2.4	1.7	0.8		NA	NA	NA	NA	NA	NA
France (Survey, 2016)		13 232	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA
Croatia	2	37 252	116	82	34	3.1	2.2	0.9	1	119	84	35	3.2	2.3	0.9
Italy	4	484 777	1055	809	246	2.2	1.7	0.5		NA	NA	NA	NA	NA	NA
Cyprus	1,2	9394	18	15	3	1.9	1.6	0.3	1,2	18	15	3	1.9	1.6	0.3
Latvia	3	21 720	55	45	10	2.5	2.1	0.5	3	54	45	9	2.5	2.1	0.4
Lithuania	2,3	31 475	74	53	21	2.4	1.7	0.7	1,2,3	74	53	21	2.4	1.7	0.7
Luxembourg	2	6832	11	9	2	1.6	1.3	0.3		NA	NA	NA	NA	NA	NA
Hungary	1	91 680	245	155	90	2.7	1.7	1.0		NA	NA	NA	NA	NA	NA
Malta		4435	NA	NA	NA	NA	NA	NA	1,2	16	12	4	3.6	2.7	0.9
Netherlands		168 425	NA	NA	NA	NA	NA	NA	1	511	431	80	3.0	2.6	0.5
Austria	1	83 607	163	130	33	1.9	1.6	0.4	1	161	130	31	1.9	1.6	0.4
Poland (2014)	1	375 647	1074	772	302	2.9	2.1	0.8		NA	NA	NA	NA	NA	NA
Portugal		85 762	NA	NA	NA	NA	NA	NA	1	177	118	59	2.1	1.4	0.7
Romania	3	201 023	859	595	264	4.3	3.0	1.3		NA	NA	NA	NA	NA	NA
Slovenia		20 273	NA	NA	NA	NA	NA	NA	1	15	12	3	0.7	0.6	0.1
Slovakia	1	55 615	110	84	26	2.0	1.5	0.5		NA	NA	NA	NA	NA	NA
Finland	1,2	55 588	69	53	16	1.2	1.0	0.3	1	73	55	18	1.3	1.0	0.3
Sweden (2014)	1	115 246	177	141	36	1.5	1.2	0.3		NA	NA	NA	NA	NA	NA
United Kingdom									1	1739	1293	446	2.2	1.7	0.6
UK: England and Wales (2014)	1	694 312	1503	1123	380	2.2	1.6	0.5		NA	NA	NA	NA	NA	NA
UK: Scotland	1,2	54 288	102	73	29	1.9	1.3	0.5	1	82	53	29	1.5	1.0	0.5
UK: Northern Ireland	2	24 462	88	77	11	3.6	3.1	0.4	2	88	77	11	3.6	3.1	0.4
Iceland	1	4088	5	4	1	1.2	1.0	0.2		NA	NA	NA	NA	NA	NA
Norway	1	59 711	86	70	16	1.4	1.2	0.3	1	87	70	17	1.5	1.2	0.3
Switzerland (2014)	1	84 891	195	159	36	2.3	1.9	0.4	1	192	156	36	2.3	1.8	0.4

1. Annual early neonatal mortality rate per 1000 live births = ((number of early neonatal deaths occurring during the year)/(number of live births occurring during the year))*1000
2. Annual late neonatal mortality rate per 1000 live births = ((number of late neonatal deaths occurring during the year)/(number of live births occurring during the year))*1000
3. Cohort early neonatal mortality rate per 1000 live births = ((number of early neonatal deaths occurring to babies born during the year)/(number of total live births occurring during the year))*1000
4. Cohort late neonatal mortality rate per 1000 live births = ((number of late neonatal deaths occurring to babies born during the year)/(number of live births occurring during the year))*1000
5. In Ireland, information on late neonatal deaths is unavailable (see C3 Infant mortality)

Inclusion criteria were based on gestational age 22+ weeks; if gestational age was missing, births were included if birth weight was at least 500 grams.

C2_B: Neonatal mortality rate for births at ≥24 weeks of gestation

			Number of live births		Number of neonatal deaths		Neonatal mortality rate	
Country/coverage	Source	Inclusion criteria for live births	All	≥24 weeks*	All	≥24 weeks*	All	≥24 weeks*
Belgium	1	22+ weeks or 500+ g	122 240	120 579	254	197	2.1	1.6
Bulgaria[1] (2014)	1	22+ weeks	67 585	67 576	298	283	4.4	4.2
Czech Republic	1	22+ weeks or 500+ g, if BW unavailable	110 764	108 188	165	131	1.5	1.2
Denmark	1,2,4	22+ weeks	57 677	57 588	109	81	1.9	1.4
Germany	2	22+ weeks	737 575	NA	1700	NA	2.3	NA
Estonia	1,3	22+ weeks	13 907	13 898	21	17	1.5	1.2
Ireland	1	22+ weeks	65 623	65 564	NA	NA	NA	NA
Greece	1	22+ weeks	91 847	91 139	260	NA	2.8	NA
Spain	1	180+ days / 500 g	420 283	356 164	771	NA	1.8	NA
France	2,3	22+ weeks or 500+ g	760 421	757 789	1860	1592	2.4	2.1
France (Survey, 2016)		22+ weeks	13 232	13 203	NA	NA	NA	NA
Croatia	1	22+ weeks	37 252	37 231	119	101	3.2	2.7
Italy	4	22+ weeks	484 777	482 771	1055	NA	2.2	NA
Cyprus	1,2	22+ weeks	9394	9230	18	12	1.9	1.3
Latvia	3	22+ weeks	21 720	21 712	54	48	2.5	2.2
Lithuania[1]	1,2,3	22+ weeks	31 475	31 464	74	64	2.4	2.0
Luxembourg	2	22+ weeks	6832	6830	11	8	1.6	1.2
Hungary[2]	1	22+ weeks	91 680	91 595	245	217	2.7	2.4
Malta	1,2	22+ weeks or 500+ g	4435	4433	16	14	3.6	3.2
Netherlands	1	22+ weeks or 500+ g	168 425	165 631	511	328	3.0	2.0
Austria	1	22+ weeks	83 607	83 543	161	113	1.9	1.4
Poland (2014)	1	22+ weeks	375 647	375 443	1074	912	2.9	2.4
Portugal	1	22+ weeks (incomplete at 22-23 weeks)	85 762	85 578	177	NA	2.1	NA
Romania	3	22+ weeks	201 023	201 004	859	706	4.3	3.5
Slovenia	1	22+ weeks	20 273	20 262	15	8	0.7	0.4
Slovakia	1	22+ weeks	55 615	55 608	110	106	2.0	1.9
Finland	1	22+ weeks	55 588	55 497	73	65	1.3	1.2
Sweden (2014)	1	22+ weeks	115 246	115 163	177	148	1.5	1.3
United Kingdom	1	22+ weeks			1739	1366		
UK: England and Wales (2014)	1	22+ weeks	694 312	670 439	1503	1136	2.2	1.7
UK: Scotland	1,2	22+ weeks	54 288	NA	102	NA	1.9	NA
UK: Northern Ireland	1	22+ weeks	24 462	24 451	88	80	3.6	3.3
Iceland	1	22+ weeks	4088	4080	5	2	1.2	0.5
Norway	1	22+ weeks	59 711	59 487	87	71	1.5	1.2
Switzerland (2014)	1	22+ weeks or 500+ g	84 891	84 820	192	149	2.3	1.8

We used cohort data, but when these were not available, we used annual data (except for Scotland where the annual data were considered to be more complete)
* excluding births with unknown GA 24+ weeks
Note: 1. In Bulgaria and Lithuania, all live births with unknown GA (N=2476 for Bulgaria; N=2579 for Lithuania) were considered as live births occured at 24+ weeks of gestational age
2. In Hungary, late neonatal deaths with unknown GA (N=90) were considered as 24+ weeks

C3: Infant mortality rate (numbers and rates per 1000 live births)

			Number of live birth	Annual deaths		Cohort deaths	
Country/coverage	Source	Inclusion criteria for live births		Infant deaths	Infant mortality rate	Infant deaths	Infant mortality rate
Belgium	1	22+ weeks or 500+ g	122 240	NA	NA	381	3.1
Bulgaria (2014)	1	22+ weeks	67 585	517	7.6	NA	NA
Czech Republic	1	22+ weeks or 500+ g, if BW unavailable	110 764	272	2.5	NA	NA
Denmark	1,2,4	22+ weeks	57 677	NA	NA	151	2.6
Germany	2	22+ weeks	737 575	2405	3.3	NA	NA
Estonia	5,3	22+ weeks	13 907	35	2.5	40	2.9
Ireland	1,2	22+ weeks	65 623	225	3.4	NA	NA
Greece	1	22+ weeks	91 847	364	4.0	NA	NA
Spain	1	180+ days / 500 g	420 283	1139	2.7	NA	NA
France	2,3	22+ weeks or 500+ g	760 421	2655	3.5	NA	NA
France (Survey, 2016)		22+ weeks	13 232	NA	NA	NA	NA
Croatia	1,2	22+ weeks	37 252	154	4.1	143	3.8
Italy	4	22+ weeks	484 777	1506	3.1	NA	NA
Cyprus	2	22+ weeks	9394	24	2.6	20	2.1
Latvia	3	22+ weeks	21 720	90	4.1	93	4.3
Lithuania	2,3	22+ weeks	31 475	132	4.2	111	3.5
Luxembourg	2,3	22+ weeks	6832	16	2.3	NA	NA
Hungary	1	22+ weeks	91 680	383	4.2	NA	NA
Malta	2	22+ weeks or 500+ g	4435	NA	NA	23	5.2
Netherlands	3	22+ weeks or 500+ g	168 425	597	3.5	NA	NA
Austria	1	22+ weeks	83 607	221	2.6	196	2.3
Poland (2014)	1	22+ weeks	375 647	1573	4.2	NA	NA
Portugal	1	22+ weeks (incomplete at 22-23 weeks)	85 762	254	3.0	NA	NA
Romania	3	22+ weeks	201 023	1493	7.4	NA	NA
Slovenia	2	22+ weeks	20 273	NA	NA	34	1.7
Slovakia	1	22+ weeks	55 615	110	2.0	NA	NA
Finland	1,2	22+ weeks	55 588	96	1.7	92	1.7
Sweden (2014)	1	22+ weeks	115 246	261	2.3	NA	NA
United Kingdom		22+ weeks		NA	NA	NA	NA
UK: England and Wales, 2014	1	22+ weeks	694 312	2204	3.2	NA	NA
UK: Scotland	1,2	22+ weeks	54 288	158	2.9	136	2.5
UK: Northern Ireland	3	22+ weeks	24 462	124	5.1	124	5.1
Iceland	1	22+ weeks	4088	6	1.5	NA	NA
Norway	1	22+ weeks	59 711	118	2.0	130	2.2
Switzerland (2014)	1	22+ weeks or 500+ g	84 891	259	3.1	254	3.0

C3: Infant mortality rate, births ≥22 weeks of gestation in 2010

		Number of live births		Percentage of live births birth weight in grams				
Country/coverage	Source	All stated	Not stated	<500	500-1499	1500-2499	2500-4499	≥4500
Belgium	1	120 600	1640	0.0	0.9	6.0	92.2	0.9
Bulgaria (2014)	1	64 813	2772	0.0	1.4	8.5	89.7	0.5
Czech Republic	1	109 141	1623	0.0	1.1	6.6	91.5	0.8
Denmark	1,2,4	57 227	450	0.0	0.7	4.2	92.5	2.5
Germany	1	725 913	24	0.1	1.2	5.7	91.8	1.2
Estonia	1	13 906	1	0.0	0.8	3.3	93.1	2.8
Ireland	1	65 623	0	0.0	0.9	4.8	92.1	2.2
Greece	1	90 772	1075	0.0	1.1	8.2	90.5	0.2
Spain	1	398 786	21 497	0.0	0.9	7.4	91.1	0.6
France	5	759 099	0	0.0	1.0	6.4	91.9	0.7
France (Survey 2016)	1	13 215	17	0.0	1.0	6.4	91.8	0.7
Croatia	1	37 252	0	0.0	0.8	4.3	93.5	1.4
Italy	1	484 399	378	0.0	1.0	6.4	92.1	0.5
Cyprus	1	9358	36	0.0	1.2	9.4	89.2	0.2
Latvia	1	21 720	0	0.0	0.7	3.8	92.7	2.8
Lithuania[1]	1,2	28 896	2579	0.0	0.7	3.8	93.4	2.1
Luxembourg	1	6831	1	0.0	0.8	5.8	92.7	0.6
Hungary	1	91 645	35	0.0	1.4	7.1	90.5	1.0
Malta	1	4431	4	0.0	0.9	5.3	93.2	0.5
Netherlands	1	168 007	418	0.1	0.9	5.1	92.1	1.8
Austria	1	83 607	0	0.0	0.9	5.5	92.5	0.9
Poland (2014)	1	375 638	9	0.0	0.9	5.0	92.7	1.4
Portugal	1	85 727	35	0.0	1.0	7.9	90.8	0.3
Romania	5	201 023	0	0.0	0.9	7.0	91.6	0.5
Slovenia	1	20 273	0	0.0	1.0	5.4	92.6	1.1
Slovakia	1	55 615	0	0.0	0.9	6.7	91.5	0.8
Finland	1	55 537	51	0.0	0.6	3.6	93.5	2.3
Sweden (2014)	1	115 210	36	0.0	0.7	3.5	92.3	3.4
United Kingdom								
UK: England and Wales	1	683 997	8905	0.1	0.9	6.0	91.4	1.6
UK: Scotland	1	54 231	57	0.0	0.9	5.9	91.1	2.0
UK: Northern Ireland	1	24 440	22	0.0	0.8	5.4	91.6	2.1
Iceland	1	4088	0	0.1	0.6	3.6	91.3	4.3
Norway	1	59 710	1	0.0	0.8	3.7	92.5	3.0
Switzerland (2014)	1	84 881	10	0.0	0.9	5.5	92.9	0.8

Note 1. In Lithuania, live births with unknown GA and BW are not included.

C4_B: Distribution of birth weight by plurality for live births in 2010

		% live births			% of live singleton births			% of live multiple births		
		Birth weight (g)			Birth weight (g)			Birth weight (g)		
Country/ coverage	Source	<1500	1500-2499	All stated	<1500	1500-2499	All stated*	<1500	1500-2499	All stated*
Belgium	1	0.9	6.0	120 600	0.7	4.5	116 452	8.1	48.2	4148
Bulgaria (2014)	1	1.4	8.5	64 813	0.9	6.8	62 533	12.6	54.4	2280
Czech Republic	1	1.2	6.6	109 141	0.8	5.2	105 930	11.5	52.4	3211
Denmark	1,2,4	0.8	4.2	57 227	0.5	3.1	55 320	7.4	38.3	1907
Germany	1	1.3	5.7	725 913	0.9	4.1		11.9	45.9	
Estonia	1	0.8	3.3	13 906	0.5	2.4	13 453	10.8	30.9	453
Ireland	1	0.9	4.8	65 623	0.6	3.3	63 158	8.8	41.3	2465
Greece	1	1.1	8.2	90 772	0.7	5.4	86 096	9.2	59.6	4676
Spain	1	1.0	7.4	398 786	0.7	5.4	381 254	7.1	51.2	17 532
France	5	1.0	6.4	759 099	0.8	5.0	735 321	8.0	47.8	23 778
France (Survey, 2016)	1	1.1	6.4	13 215	0.8	5.0	12 757	9.8	45.6	458
Croatia	1	0.8	4.3	37 252	0.7	3.2	36 150	6.6	39.0	1102
Italy	1	1.0	6.4	484 399	0.7	4.8	468 226	9.2	53.0	16 173
Cyprus	1	1.2	9.4	9358	0.6	6.7	8 876	11.0	60.2	482
Latvia	1	0.7	3.8	21 720	0.6	2.8	21 073	5.7	34.6	647
Lithuania[1]	1	0.7	3.8	28 896	0.5	2.9	28 097	6.9	33.4	799
Luxembourg	1	0.9	5.8	6831	0.5	4.2	6 590	10.8	49.4	241
Hungary	1	1.4	7.1	91 645	NA	NA	NA	NA	NA	NA
Malta	1	1.0	5.3	4431	0.7	3.9	4 299	11.4	52.3	132
Netherlands	1	1.0	5.1	168 007	0.8	3.8	162 728	7.8	43.6	5279
Austria	1	1.0	5.5	83 607	0.7	4.1	81 012	9.6	49.2	2595
Poland (2014)	1	0.9	5.0	375 638	0.7	3.8	365 900	8.4	49.4	9738
Portugal	1	1.0	7.9	85 727	0.7	6.0	82 771	9.5	59.7	2956
Romania	5	0.9	7.0	201 023	0.7	6.1	196 892	8.7	50.7	4131
Slovenia	1	1.0	5.4	20 273	0.7	3.7	19 497	8.6	48.5	776
Slovakia	1	1.0	6.7	55 615	0.8	5.6	54 217	8.8	50.6	1398
Finland	1	0.6	3.6	55 537	0.5	2.6	54 061	6.8	38.2	1476
Sweden (2014)	1	0.8	3.5	115 210	0.6	2.6	111 811	7.7	35.0	3399
United Kingdom										
UK: England and Wales	1	1.0	6.0	683 997	0.8	4.7	663 099	8.7	48.7	20 898
UK: Scotland	1	0.9	5.9	54 230	0.7	4.6	52 673	8.0	49.5	1557
UK: Northern Ireland	1	0.9	5.4	24 440	0.6	4.0	23 740	9.0	51.1	700
Iceland	1	0.7	3.6	4088	0.6	2.2	3 945	5.6	43.4	143
Norway	1	0.8	3.7	59 710	0.6	2.5	57 732	6.9	38.7	1978
Switzerland (2014)	1	0.9	5.5	84 881	0.6	3.9	81 833	8.6	47.6	3048

Note 1. In Lithuania, live births with unknown GA and BW are not included.

C5_A: Distribution of gestational age for live births

		Number of live births		Percentage of live births						
				Gestational age in weeks						
Country/coverage	Source	All stated	Not stated	22-23	24-27	28-31	32-36	37-38	39-41	≥42
Belgium	1	120 627	1613	0.0	0.3	0.7	7.0	26.7	65.1	0.2
Bulgaria (2014)	1	65 109	2476	0.0	0.2	0.8	6.3	21.5	70.5	0.6
Czech Republic	1	108 220	2544	0.0	0.3	0.8	6.4	19.1	70.2	3.1
Denmark	1,2,4	57 619	58	0.1	0.3	0.6	5.3	18.8	72.9	2.1
Germany	1	725 680	266	0.1	0.4	0.9	7.2	25.4	65.6	0.5
Estonia	1	13 906	1	0.1	0.3	0.7	4.7	17.8	73.9	2.6
Ireland	1	65 613	10	0.1	0.2	0.7	5.4	19.1	72.1	2.4
Greece	1	91 175	672	0.0	0.3	0.9	10.1	43.7	45.0	
Spain	1	356 197	64,086	0.0	0.3	0.7	6.6	23.1	67.7	1.6
France	5	758 056	0	0.0	0.3	0.7	6.1	21.6	70.4	0.8
France (Survey, 2016)	1	13 212	20	0.1	0.4	0.8	6.3	22.9	69.1	0.5
Croatia	1	37 252	0	0.1	0.3	0.5	5.6	21.9	69.5	2.0
Italy	1	482 976	1801	0.0	0.3	0.7	6.6	27.8	63.7	0.9
Cyprus	1	9237	157	0.1	0.3	0.8	10.9	43.7	44.1	0.2
Latvia	1	21 720	0	0.0	0.3	0.6	4.8	17.7	75.4	1.1
Lithuania[1]	1,2	28 896	2579	0.0	0.2	0.5	4.6	16.4	78.2	0.1
Luxembourg	1	6831	1	0.0	0.2	0.8	6.3	30.2	62.4	0.1
Hungary	1	91 635	45	0.0	0.5	0.9	7.3	26.5	64.6	0.2
Malta	1	4435	0	0.0	0.3	0.5	5.8	30.6	62.5	0.2
Netherlands	1	165 833	2592	0.1	0.3	0.7	5.8	23.6	68.2	1.3
Austria	1	83 607	0	0.1	0.3	0.8	6.7	24.5	67.3	0.4
Poland (2014)	1	375 642	5	0.1	0.3	0.7	6.2	22.1	69.1	1.5
Portugal	1	85 591	171	0.0	0.2	0.8	7.0	27.0	64.8	0.1
Romania	5	201 023	0	0.0	0.2	0.9	7.4	27.3	63.7	0.6
Slovenia	1	20 273	0	0.1	0.3	0.8	6.4	19.8	72.0	0.7
Slovakia	1	55 615	0	0.0	0.3	0.7	6.0	20.9	71.5	0.6
Finland	1	55 516	72	0.0	0.2	0.5	5.0	18.0	72.3	4.0
Sweden (2014)	1	115 229	17	0.1	0.3	0.6	4.8	18.5	68.8	7.0
United Kingdom										
UK: England and Wales	1	692 902	3155	0.1	0.3	0.8	6.4	20.8	68.9	2.7
UK: Scotland	1	54 057	231	0.0	0.3	0.7	7.1	19.6	70.3	1.9
UK: Northern Ireland	1	24 462	0	0.0	0.2	0.8	6.3	20.5	71.3	0.8
Iceland	1	4086	2	0.1	0.2	0.5	5.3	16.8	75.2	1.9
Norway	1	59 513	198	0.0	0.3	0.6	5.3	18.3	71.7	3.8
Switzerland (2014)	1	84 866	25	0.1	0.3	0.6	6.2	26.5	65.7	0.5

Note 1. In Lithuania, live births with unknown GA and BW are not included.

C5_B: Distribution of gestational age by plurality for live births

			% of live births			% of live singleton births			% of live multiple births	
			Gestational age in weeks			Gestational age in weeks			Gestational age in weeks	
Country/coverage	Source	All stated	<32	32-36	All Stated	<32	32-36	All Stated	<32	32-36
Belgium	1	120 627	1.1	7.0	116 474	0.8	5.5	4153	9.5	49.1
Bulgaria (2014)	1	65 109	1.1	6.3	62 819	0.8	4.9	2290	9.0	43.0
Czech Republic	1	108 220	1.1	6.4	105 050	0.9	5.2	3170	10.4	46.4
Denmark	1,2,4	57 619	0.9	5.3	55 692	0.7	4.2	1927	8.3	36.7
Germany	1	725 937	1.3	7.2	698 955	0.9	5.6	27 382	11.7	47.0
Estonia	1	13 906	1.1	4.7	13 453	0.7	3.7	453	12.4	34.2
Ireland	1	65 613	1.1	5.4	63 148	0.7	3.9	2465	9.5	43.8
Greece	1	91 175	1.3	10.1	86 482	0.8	7.3	4693	8.9	61.6
Spain	1	356 197	1.0	6.6	340 215	0.7	4.9	15 982	7.1	42.6
France	5	758 056	1.0	6.1	731 479	0.7	4.8	26 577	8.9	42.6
France (Survey, 2016)	1	13 212	1.2	6.3	12 753	0.9	5.1	459	10.9	38.3
Croatia	1	37 252	0.9	5.6	36 150	0.7	4.6	1102	8.1	40.0
Italy	1	482 976	1.0	6.6	466 813	0.7	5.0	16 163	9.1	51.8
Cyprus	1	9237	1.1	10.9	8756	0.7	8.3	481	9.4	58.8
Latvia	1	21 720	0.9	4.8	21 073	0.8	4.0	647	7.0	31.4
Lithuania[1]	1	28 896	0.8	4.6	28 097	0.6	3.7	799	7.5	36.9
Luxembourg	1	6831	1.1	6.3	6589	0.5	4.9	242	14.9	42.6
Hungary		NA	NA	NA	NA	NA	NA	NA	NA	NA
Malta	1	4435	0.9	5.8	4303	0.7	4.7	132	8.3	43.2
Netherlands	1	165 833	1.1	5.8	160 578	0.9	4.5	5255	9.0	43.5
Austria	1	83 607	1.2	6.7	81 012	0.9	5.3	2595	10.4	50.2
Poland (2014)	1	375 642	1.1	6.2	365 902	0.8	5.0	9740	9.5	52.8
Portugal	1	85 591	1.0	7.0	82 637	0.7	5.3	2954	9.2	55.5
Romania	5	201 023	1.1	7.4	196 892	0.9	6.6	4131	8.2	41.7
Slovenia	1	20 273	1.1	6.4	19 497	0.8	4.6	776	9.9	50.5
Slovakia	1	55 615	1.0	6.0	54 217	0.8	5.0	1398	9.9	45.0
Finland	1	55 516	0.8	5.0	54 036	0.6	3.9	1480	7.3	45.4
Sweden (2014)	1	115 229	0.9	4.8	111 827	0.7	3.9	3402	8.5	34.2
United Kingdom										
UK: England and Wales	1	692 902	1.2	6.4	671 040	0.9	5.0	21 862	9.8	49.3
UK: Scotland	1	54 056	1.1	7.1	52 501	0.9	5.7	1555	8.7	56.2
UK: Northern Ireland	1	24 462	1.1	6.3	23 762	0.8	4.9	700	12.0	53.4
Iceland	1	4086	0.8	5.3	3943	0.6	3.8	143	5.6	48.3
Norway	1	59 513	0.9	5.3	57 543	0.7	4.0	1970	7.7	41.6
Switzerland (2014)	1	84 866	1.0	6.2	81 818	0.7	4.7	3048	9.5	48.5

Note 1. In Lithuania, live births with unknown GA and weight are not included.

C6_A: Maternal mortality ratio (numbers and ratios per 100 000 live births) from routine statistics

Country/coverage	Source	Number of live births (2011-2015)	Number of maternal deaths	Maternal Mortality Ratio per 100 000 live births	Alternate years of data provided	Enhanced
Belgium	1	629 650	29	4.6		
Bulgaria	1	349 643	24	6.9	2010-2014	
Czech Republic						Yes
Denmark	3,4	287 862	9	3.1		
Germany	2	3470 800	145	4.2		
Estonia	3,4	69 886	3	4.3		Yes
Ireland	1,2	347 706	9	2.6		Yes
Greece	1	484 929	14	2.9		
Spain	1	2266 532	71	3.1	2010-2014	
France	3	4107 315	264	6.4	2010-2014	Yes
France (Survey, 2016)						
Croatia	2	199 976	11	5.5		
Italy	5	2938 004	107	3.6	2006-2012	Yes
Cyprus	4	48 017	3	6.2		Yes
Latvia	2	101 415	25	24.7		
Lithuania	2,3	152 423	10	6.6		
Luxembourg	3	33 111	2	6.0	2012-2013	
Hungary	1,2	450 197	59	13.1		
Malta	2	21 392	0	0.0		
Netherlands						Yes
Austria	2	401 581	44	11.0		
Poland	1	1932 709	37	1.9	2010-2014	
Portugal	1	437 687	26	5.9		
Romania	1	1008 913	151	15.0		
Slovenia	2	105 618	6	5.7		
Slovakia	2	281 758	12	4.3		
Finland	2	291 387	8	2.7		
Sweden	1	554 769	20	3.6	2010-2014	
United Kingdom[1]	EW:2 Scotland: 2 NI: 3"	3952 352	242	6.1		Yes
Iceland	1	21 766	1	4.6		
Norway	1	300 264	13	4.3		
Switzerland	1	411 163	20	4.9	2010-2014	

Note: 1. Numbers of deaths for the United Kingdom are the sum of the numbers of registered deaths in England and Wales, Scotland and Northern Ireland

C6_B: Maternal mortality ratio (numbers and ratios per 100 000 live births) from enhanced data systems

Country/coverage	Source	Number of live births (2011-2015)	Number of maternal deaths	Maternal mortality ratio per 100 000 live births	Alternate years of data provided
Belgium					
Bulgaria					
Czech Republic	2	433 860	33	7.6	
Denmark					
Germany					
Estonia	3,4	69 886	9	12.9	
Ireland	1,3	347 706	32	9.2	
Greece					
Spain					
France	4	4130 285	369	8.9	2008-2012
France (Survey, 2016)					
Croatia					
Italy	10	2132 333	207	9.7	2008-2012
Cyprus					
Latvia					
Lithuania					
Luxembourg					
Hungary					
Malta					
Netherlands	2	855 310	44	5.1	
Austria					
Poland					
Portugal					
Romania					
Slovenia					
Slovakia					
Finland					
Sweden					
United Kingdom	2	2341 624	200	8.5	2012-2014
Iceland					
Norway					
Switzerland					

C7: Multiple birth rate (rates per 1000 women)

		Number of women		Multiple birth rate per 1000 women		
Country/coverage	Source	All stated	Not stated	Twins	Triplets or more	Multiples
Belgium	1	120 681	0	17.3	0.3	17.6
Bulgaria[1] (2014)	1	64 427	0	17.8	0.2	18.0
Czech Republic	2	107 618	0	14.5	0.1	14.7
Denmark[2]	1,2,4	56 895	0	16.9	0.2	17.0
Germany	1	714 574	0	18.8	0.4	19.2
Estonia	1	13 731	0	16.6	0.1	16.7
Ireland	1	64 650	0	18.7	0.5	19.2
Greece[3]	1	88 554	4	13.2	0.1	13.3
Spain	1	412 266	0	22.1	0.3	22.4
France	5	748 589	0	17.1	0.3	17.5
France (Survey, 2016)	1	13 077	0	17.3	0.4	17.7
Croatia	1	36 866	0	14.8	0.2	15.0
Italy	9	478 003	403	16.4	0.4	16.9
Cyprus	1	9171	0	26.0	0.9	26.8
Latvia	1	21 496	0	15.1	0.1	15.2
Lithuania[4]	1,2	28 608	0	13.4	0.4	13.7
Luxembourg	1	6762	0	17.9	0.4	18.3
Hungary (2012)[3]	1	88 819	0	16.0	0.3	16.4
Malta	1	4385	0	15.1	0.2	15.3
Netherlands	1	166 700	0	16.7	0.3	17.0
Austria	1	82 565	0	15.4	0.3	15.7
Poland (2014)	1	372 046	0	13.0	0.2	13.2
Portugal	1	84 556	0	17.3	0.2	17.5
Romania[3]	1	199 646	0	10.1	0.2	10.4
Slovenia[2]	1	20 003	0	19.3	0.2	19.5
Slovakia	1	55 112	0	12.7	0.1	12.8
Finland	1	55 080	0	13.4	0.1	13.5
Sweden (2014)	1	113 999	0	14.9	0.2	15.1
United Kingdom						
UK: England and Wales	2	689 751	0	15.8	0.2	16.1
UK: Scotland	1	53 689	62	14.2	0.3	14.6
UK: Northern Ireland	3	23 937	0	14.3	0.3	14.6
Iceland	1	4026	0	17.4	0.2	17.6
Norway	1	58 927	0	16.6	0.2	16.9
Switzerland (2014)	1	83 696	0	18.0	0.4	18.3

Note 1. In Bulgaria, mothers of babies with unknown GA are not included.
2. In Denmark and Slovenia, data are based on mothers delivering live or stillbirths (and terminations).
3. In Greece, Hungary and Romania multiple maternity rate was calculated based on number of births. N total births for Greece = 92 159; N total births for Hungary = 90 305; N total births for Romania = 201 760
4. In Lithuania, mothers with babies of unknown GA are not included

C8: Distribution of maternal age (rates per 100 women)

		Number of Women		Percentage of women delivering live or stillbirths									
				Age in years									
Country/coverage	Source	All stated	Not stated	<15	15-17	18-19	20-24	25-29	30-34	35-39	40-44	45-49	≥50
Belgium	1	120 618	63	0.0	0.4	1.3	11.9	33.9	33.9	15.2	3.1	0.2	0.0
Bulgaria[1] (2014)	1	64 427	0	0.5	4.3	5.4	21.7	30.9	23.6	11.5	2.0	0.1	0.0
Czech Republic	2	107 545	73	0.0	0.0	2.4	12.3	29.9	34.4	17.7	3.2	0.1	0.0
Denmark[2]	1,2,4	56 895	0	0.0	0.1	0.9	11.0	32.7	34.1	17.3	3.7	0.2	0.0
Germany	1	714 574	0	0.0	0.6	1.6	10.9	28.5	35.3	19.2	3.9	0.2	0.0
Estonia	1	13 731	0	0.0	0.7	2.0	14.6	33.9	29.0	15.6	4.0	0.2	0.0
Ireland	1	64 648	2	0.0	0.5	1.4	8.8	19.0	36.1	28.0	6.0	0.3	0.0
Greece[3]	1	92 159	0	0.1	1.0	1.4	8.0	22.5	37.3	23.7	5.2	0.7	0.1
Spain	1	412 266	0	0.0	0.7	1.3	7.2	18.0	35.4	29.7	7.1	0.4	0.0
France	5	748 581	8	0.1	0.4	1.5	12.5	31.7	33.2	16.4	3.9	0.2	0.0
France (Survey, 2016)	1	13 071	6	2.0			11.9	31.2	33.7	17.2	3.8	0.2	
Croatia	1	36 866	0	0.0	0.8	2.2	14.2	30.6	33.2	15.9	2.8	0.2	0.0
Italy	9	478 061	345	0.0	0.3	1.0	8.2	21.1	33.1	26.5	9.0	0.7	0.1
Cyprus	1	9153	18	0.0	0.4	1.0	9.2	30.5	37.5	17.4	3.7	0.3	0.0
Latvia	1	21 496	0	0.0	0.9	2.5	17.1	32.7	28.4	14.5	3.6	0.2	0.0
Lithuania4	1,2	28 608	2552	0.0	1.0	2.8	16.5	35.2	28.8	12.9	2.7	0.1	0.0
Luxembourg	1	6762	0	0.1	0.3	1.1	8.5	25.2	37.4	22.7	4.4	0.3	0.0
Hungary[3,5]	1	91 690	0	0.1	2.3	4.0	14.6	25.1	30.0	19.6	4.2	0.1	0.0
Malta	1	4385	0	0.1	1.1	1.8	11.6	30.0	36.3	16.1	2.9	0.1	0.0
Netherlands	1	166 696	4	0.0	0.2	0.7	9.3	30.9	38.1	17.6	3.1	0.1	0.0
Austria	1	82 565	0	0.0	0.5	1.6	13.2	29.8	34.2	16.7	3.7	0.2	0.0
Poland (2014)	1	372 046	0	0.0	0.9	2.7	16.1	34.5	31.1	12.4	2.2	0.1	0.0
Portugal	1	84 552	4	0.1	0.8	1.8	10.3	22.4	35.2	24.0	5.2	0.2	0.0
Romania[3,5]	5	201 023	0	0.3	4.3	5.0	19.1	32.7	24.1	12.1	2.3	0.1	0.0
Slovenia[2]	1	20 003	0	0.0	0.2	0.8	10.5	33.6	36.2	15.7	2.8	0.1	0.0
Slovakia	1	55 078	34	0.1	2.3	3.9	15.9	30.0	30.9	14.3	2.5	0.1	0.0
Finland	1	55 080	0	0.0	0.3	1.4	14.0	29.4	34.1	17.2	3.4	0.2	0.0
Sweden (2014)	1	112 769	1230	0.0	0.2	1.0	12.8	30.9	33.6	17.3	4.0	0.2	0.0
United Kingdom													
UK: England and Wales	2	689 751	0	0.0	0.9	2.6	15.6	28.5	31.2	17.2	3.8	0.3	0.0
UK: Scotland	1	53 751	0	0.0	1.1	2.9	15.9	27.9	31.5	17.0	3.5	0.2	0.0
UK: Northern Ireland	1	24 544	0	0.0	0.8	2.3	14.0	27.3	33.2	18.4	3.6	0.3	0.0
Iceland	1	4026	0	0.0	0.3	1.8	16.0	32.4	29.3	16.3	3.5	0.3	0.0
Norway	1	58 927	0	0.0	0.2	1.1	12.2	32.8	33.5	16.7	3.3	0.2	0.0
Switzerland (2014)	1	83 696	0	0.0	0.1	0.6	8.2	25.6	38.2	22.2	4.7	0.3	0.0

Note 1. In Bulgaria, mothers with babies of unknown GA are not included.
2. In Denmark and Slovenia, data are based on mothers delivering live or stillbirths (and terminations).
3. In Greece, Hungary, and Romania data are based on babies.
4. In Lithuania, mothers with babies of unknown GA and weight are not included.
5. In Hungary and Romania, data are based on live births only. In Hungary, data include 10 births <22 weeks and <500 g which could not be removed.

C9: Distribution of parity (rates per 100 women)

		Number of live births		Percentage of women delivering live or stillbirths				
				Parity				
Country/coverage	Source	All stated	Not stated	0	1	2	3	4+
Belgium	1	120 615	66	42.5	34.5	14.7	5.3	3.0
Bulgaria[1] (2014)	1	65 503	99	51.2	36.0	7.7	2.5	2.7
Czech Republic	2	107 618	0	48.3	35.7	11.3	2.9	1.8
Denmark[2]	1,2,4	56 895	0	45.5	37.5	12.8	2.9	1.4
Germany	1	714 574	0	49.0	34.3	11.4	3.5	2.0
Estonia	1	13 731	0	42.3	37.3	14.4	4.0	2.1
Ireland	1	64 650	0	38.2	34.8	17.8	6.1	3.1
Greece[1]	1	92 159	0	47.8	39.0	9.8	3.4	
Spain	1	412 266	0	51.5	48.5			
France								
France (Survey, 2016)	1	13 074	3	42.5	35.4	14.3	4.8	3.0
Croatia	1	36 866	0	49.0	33.3	12.0	3.2	2.4
Italy	9	478 154	252	52.7	35.0	9.5	2.1	0.8
Cyprus	1	9166	5	48.4	36.3	11.2	3.0	1.1
Latvia	1	21 496	0	43.1	37.3	13.8	3.6	2.1
Lithuania	2	31 587	14	47.4	37.6	10.6	2.5	1.8
Luxembourg	1	6762	0	47.6	35.5	11.8	3.6	1.6
Hungary[1,3]	1	91 449	241	46.7	32.3	13.5	4.1	3.3
Malta	1	4385	0	50.7	34.8	9.5	3.1	1.9
Netherlands	1	166 659	41	44.6	36.1	13.4	3.8	2.0
Austria	1	82 565	0	48.8	35.0	11.4	3.2	1.6
Poland (2014)	1	372 036	10	48.1	37.3	10.2	2.7	1.7
Portugal	1	84 556	0	53.5	35.6	8.0	2.0	0.8
Romania[1,3]	2	201 760	0	54.5	29.3	8.4	3.4	4.4
Slovenia[2]	1	20 003	0	49.0	38.0	10.0	2.0	1.0
Slovakia	1	49 480	5632	41.7	37.0	12.0	4.1	5.2
Finland	1	55 080	0	41.6	34.3	14.4	4.9	4.8
Sweden (2014)	1	113 815	184	43.1	37.4	13.5	3.7	2.2
United Kingdom								
UK: England and Wales	2	686 587	3164	38.8	36.1	15.5	5.8	3.8
UK: Scotland	1	53 624	127	43.2	35.5	13.7	4.7	2.7
UK: Northern Ireland	1	24 544	0	38.4	34.8	17.7	6.2	2.9
Iceland	1	4025	1	39.8	35.4	18.5	4.8	1.6
Norway	1	58 924	3	42.7	36.6	15.0	3.9	1.8
Switzerland (2014)	1	83 377	319	49.5	36.5	11.1	2.3	0.7

Note 1. In Bulgaria, Greece, Hungary and Romania data are based on babies.
2. In Denmark and Slovenia, data are based on mothers delivering live or stillbirths (and terminations).
3. In Hungary and Romania, data are based on live births only. In Hungary, data include 10 births <22 weeks and <500 g which could not be removed.

C10: Mode of delivery (rates per 100 total births)

		Number of total births		Percentage of total births					
				Mode of delivery					
Country/coverage	Source	All stated	Not stated	Vaginal - spontaneous	Vaginal - instrument	Vaginal - total	Caesarean - no labour or elective	Caesarean - during labour or emergency	Caesarean - total
Belgium	1	121 185	1653	69.2	9.5	78.7	11.3	10.0	21.3
Bulgaria (2014)	2	62 912	1435			57.0			43.0
Czech Republic[1]	2	107 618	0	71.2	2.7	73.9	17.4	8.7	26.1
Denmark	1,2,4	57 847	0	72.0	6.4	78.4	11.3	10.3	21.6
Germany	1	728 496	0	60.9	6.8	67.8	16.1	16.1	32.2
Estonia	1	13 961	0	76.3	4.2	80.5	6.6	12.9	19.5
Ireland	1	65 912	1	53.6	15.1	68.7			31.3
Greece									
Spain	2	385 478	27 965	60.4	15.1	75.4	8.5	16.0	24.6
France	5	758 890	2990	67.9	11.2	79.1	7.1	13.8	20.9
France[2] (Survey, 2016)	1	13 301	10	67.6	12.1	79.8	9.8	10.5	20.2
Croatia	1	37 428	0	77.0	1.4	78.4	11.5	10.1	21.6
Italy	9	480 217	6340	61.1	3.5	64.6	22.7	12.8	35.4
Cyprus	1	9422	3	39.4	3.7	43.1	40.5	16.4	56.9
Latvia	1	21 826	0	75.6	2.4	78.0	9.3	12.7	22.0
Lithuania	1,2	29 019	2582	76.3	1.9	78.1	8.4	13.4	21.9
Luxembourg	1	6861	1	56.1	11.2	67.3	16.9	15.8	32.7
Hungary	3	92 098	0			61.0			39.0
Malta	1	4453	0	63.8	4.2	68.0	19.5	12.5	32.0
Netherlands	1	165 295	3939	74.1	8.4	82.6	8.7	8.7	17.4
Austria	1	83 884	0	63.1	7.2	70.3	14.6	15.0	29.7
Poland (2014)	2	369 709	0			57.8			42.2
Portugal[3]	3	83 957	2091			67.1			32.9
Romania	4	153 746	48 004	52.6	0.5	53.1	3.6	43.3	46.9
Slovenia	1	20 336	0	75.9	2.8	78.8	9.8	11.5	21.2
Slovakia	1	55 824	0	66.8	2.1	68.9	17.7	13.4	31.1
Finland	1	55 759	0	74.4	9.2	83.6	6.4	10.0	16.4
Sweden (2014)	1	115 710	0	75.7	6.0	81.7	7.8	10.5	18.3
United Kingdom									
UK: England	1	632 784	3446	60.0	13.0	73.0	11.5	15.5	27.0
UK: Wales	2	32 128	210	63.1	10.9	73.9	12.0	14.0	26.1
UK: Scotland[4]	1	54 273	240	55.3	12.2	67.5	14.9	17.6	32.5
UK: Northern Ireland	1	24 540	4	58.2	12.0	70.1	15.4	14.5	29.9
Iceland	1	4091	7	76.4	7.6	83.9	8.4	7.6	16.1
Norway	1	59 930	0	73.3	10.2	83.5	5.8	10.7	16.5
Switzerland[2] (2014)	1,2,3	81 969	3237	54.9	10.8	65.8	17.8	16.4	34.2

Note. 1. In the Czech Republic, N corresponds to the number of mothers instead of babies.
2. In Switzerland, there are 185 caesarean sections with unknown mode of onset that are not included here, and three in France
3. In Portugal, N corresponds to the number of deliveries instead of babies.
4. In Scotland, 181 vaginal deliveries with unknown mode of delivery (instrumental or not) are excluded here.

R8: Percentage of women who smoked during pregnancy in 2015

		Definition of period		Period 1			Period 2		
Country/ coverage	Source	Period 1	Period 2	All stated N	Not stated N	Smokers %	All stated N	Not stated N	Smokers %
Belgium									
Bulgaria									
Czech Republic	2		During pregnancy				107,618	0	7.2
Denmark	1	1st trimester	2nd trimester	56416	479	11.0	56 416	479	7.5
Germany	1		During pregnancy				490 834	203 740	9.0
Estonia	1	1st trimester	During pregnancy	13128	603	7.6	13 128	603	6.1
Ireland									
Greece									
Spain									
ES: Catalonia	3	Before pregnancy	3rd trimester	63400	7061	22.8	60 292	10 169	13.0
ES: Valencia (2016)	4		End of pregnancy				23 658	5886	18.3
France (Survey, 2016)	1	Before pregnancy	3rd trimester	11702	1375	29.8	11 720	1357	16.3
Croatia	1		During pregnancy				35 847	1019	7.8
Italy (2013)	11	Before pregnancy	During pregnancy			20.5			5.3
Cyprus	1		During pregnancy				8 858	313	6.3
Latvia	1		During pregnancy				21 496	0	7.9
Lithuania	1	Before pregnancy	During pregnancy	28608	2552	8.0	28 608	2552	4.4
Luxembourg	1	1st trimester	3rd trimester	6720	42	13.3	6713	49	10.7
Hungary									
Malta	1	At booking		4385	0	7.7			
Netherlands	4		During pregnancy				1682	59	6.0
Austria	1		3rd trimester				62 326	20 239	12.5
Poland									
Portugal									
Romania									
Slovenia	1		During pregnancy				20 003	0	9.5
Slovakia									
Finland	1	1st trimester	After 1st trimester	53988	1771	14.7	53 988	1771	7.5
Sweden	1	1st trimester	3rd trimester	110016	4973	5.1	109 308	5681	3.8
United Kingdom									
UK: England (2015/16)	2	Booking	Delivery	438099	126756	14.2	456 344	108 511	12.3
UK: Wales	2		3rd trimester				29 584	1576	17.3
UK: Scotland	1	At booking		52237	1539	16.4			
UK: Northern Ireland	1		During pregnancy				24 172	15	14.3
Iceland									
Norway	1	First visit	End of pregnancy	53610	5317	5.5	50 009	8918	3.6
Switzerland									

R12: Distribution of maternal prepregnancy body mass index

		Prepregnancy body mass index		Percentage of women delivering live or stillbirths			
Country/coverage	Source	All stated	Not stated	<18.5	18.5-24.9	25.0-29.9	≥30.0
Belgium	1	112 745	7964	5.4	59.1	22.8	12.7
Bulgaria							
Czech Republic							
Denmark	1	56 308	587	4.6	62.0	20.8	12.6
Germany	1	669 397	45 177	3.9	58.1	23.1	14.9
Estonia							
Ireland							
Greece							
Spain							
France, Survey (2016)	1	11 588	1489	7.4	60.8	20.0	11.8
Croatia	1	35 102	1764	5.5	67.6	19.0	7.8
Italy							
Cyprus							
Latvia							
Lithuania							
Luxembourg							
Hungary							
Malta	1	3475	910	2.8	59.7	23.8	13.7
Netherlands							
Austria	1	79 100	3465	6.4	64.5	19.0	10.0
Poland							
Portugal							
Romania							
Slovenia	1	19 983	20	4.7	66.1	19.6	9.6
Slovakia							
Finland	1	54 577	1182	3.5	61.2	22.1	13.2
Sweden (2014)	1	108 218	6771	2.6	57.8	25.9	13.7
United Kingdom							
UK: England (2015/16)	2	461 266	103 589	2.9	47.5	28.4	21.2
UK: Wales (2016)	1	24 040	0	2.4	43.6	28.4	25.6
UK: Scotland	1	52 387	1389	2.9	46.5	27.9	22.7
UK: Northern Ireland	1	23 871	316	1.9	47.9	29.8	20.4
Iceland							
Norway	1	43 683	15 239	4.2	62.4	21.6	11.6
Switzerland							

APPENDIX C:

Country	Source N°	Source name	Start date	Data from	Type of data	Coverage	Completeness	Participation	Linked Source	Institution	Other comments on data source
					P= Population H= hospital O= Other	C= Country level O= Other	U = Unknown	O= Obligatory V= Voluntary	Y= Yes N=No		
Austria	1	birth + cause of death statistics for infant death	1984	2015	P	C	100%	0	Y	Statistics Austria	Linkage of birth statistics and causes of death statistics for infant death
Austria	2	Cause of death statistics	1970	2015	P	C	99%	0	N	Statistics Austria	
Belgium	1	Civil Registration	1966	2015	H	C	100%	0	Y	Statistics Belgium (Statbel)	
Bulgaria	1	Vital Statistics		2014	P	C	100%	0	NA	National Statistics Institute	
Bulgaria	2	National birth register	2011	2014	P	C	100%	0	N	National center for public health and analysis	
Bulgaria	3	National center for public health and analysis	2000	2014	P	C	U	0	N	National center for public health and analysis	
Croatia	1	Croatian Medical Birth Database	1990	2015	H	C	100%	0	Y	Croatian Public Health Institute	
Croatia	2	Croatian Mortality Database	NA	2015	P	C	U	0	N	Croatian Central Bureau of Statistics (CBS)	
Cyprus	1	Birth Register	2007	2015	H	C	100%	0	Y	The Health Monitoring Unit, Cyprus ministry of health	The recording of medical data for births started from the year 2007 for all public maternity units. From the year 2014 the data also includes the private maternity units as well.
Cyprus	2	Death Register	2004	2015	P	C	100%	0	Y	The Health Monitoring Unit, Cyprus ministry of health	Death certificates, collected and coded by the Health monitoring unit. All administrative sources of information are used to collect data on deaths: medical death certificates, autopsy reports, coroner's reports, population registry of ministry of interior, EMCDDA of Cyprus, police records, accidents at work from the Ministry of Labor, Ministry of Foreign Affairs for deaths abroad. Even press reports are used to corroborate data.
Cyprus	3	Combined data from Demographic Report and from the Death Register	2004-2007	2015	P	C	100%	0	Y	Health Monitoring Unit, Cyprus Ministry of Health	
Cyprus	4	Combined data from the Birth register, Death register, and the Demographic Report	2011-2020	2015	P	C	99%	0	Y	Statistical Service and Ministry of Health	Covers all residents except nationals who deliver out of the country.
Czech Republic	1	Czech Statistical Office (CZSO)	1987	2015	P	C	100%	0	N	Czech Statistical Office (CZSO)	Vital statistics

Country	Source N°	Source name	Start date	Data from	Type of data	Coverage	Completeness	Participation	Linked Source	Institution	Other comments on data source
Czech Republic	2	Institute of Health Statistics and Information of the Czech Republic	2001	2015	P	C	99.5%	0		Institute of Health Statistics and Information of the Czech Republic	
Denmark	1	Medical birth register	1973	2015	P	C	± 100 %		Y	The Danish Health Data authority, under the Danish Ministry of Health	Hospital and home births included
Denmark	2	National patient register	1977	2015	P	C	± 100 %		N	The Danish Health Data authority, under the Danish Ministry of Health	Contains information on all contacts with the Danish hospitals
Denmark	3	Danish causes of death register	1970	2015	P	C	100%	0	N	The Danish Health Data authority, under the Danish Ministry of Health	Causes of death, civil status and causes of death related data
Denmark	4	The Centralized Civil Register		2015	P						
Estonia	1	Estonian Medical Birth Register	1992	2015	H/P (both)	C	99.9%	0	Y	National Institute for Public Health	Includes all deliveries in Estonia, including home deliveries
Estonia	2	Estonian Cause of Death Register	1983	2015	H/P (both)	C	99.6%	0	Y	National Institute for Public Health	Includes all deaths on the territory of Estonia, partly court decisions and deaths abroad of Estonian residents
Estonia	3	Linked Data from EMSR (Medical Birth) and SPR (Causes of Death)	1992	2015	0	C	99.8%	0	Y	National Institute for Public Health	Some births, occurring to residents abroad, can be registered in later years.
Estonia	4	Report of a health care institution on maternal deaths and child health	1960	2015	P	C	_	NA	N	Health Statistics Unit, National Institute for Public Health	
Estonia	5	Statistics Estonia based on Registry of Causes of Death	1920	2015	P	C	NA	NA	N	National Institute for Public Health	
Finland	1	Medical Birth Register	1987	2015	P	C	100%	0	Y	National Institute for Health and Welfare THL	Covers all occurring births in Finland despite citizenship or residence.
Finland	2	Cause-of-Death Register	1936	2015	P	C	100%	0	N	Statistics Finland	Includes Finnish citizens and permanent residents (with valid ID number).
France	1	National Perinatal Survey	2016	2016	P	C	100% for the minimum data set (core indicators)	V	N	INSERM	Representative sample of births in France.
France	2	Civil Registration	1900	2015	P	C	100%	0	N	INSEE (National Institute Of Statistics and Economics Studies)	Recording of births, deaths on the French territory
France	3	Routine death statistics	1979	2015	P	C	100%	0	N	National centre of statistics for medical causes of death (CépiDc)	
France	4	National confidential survey on maternal mortality, ENCMM	1996	2015	0	C	100%	V	Y	Inserm UMR 1153-Obstetrical, Perinatal and Pediatric Epidemiology Research Team	death certificates of women of reproductive age, birth registers and national hospital discharge data

Country	Source N°	Source name	Start date	Data from	Type of data	Coverage	Completeness	Participation	Linked Source	Institution	Other comments on data source
France	5	PMSI	1998	2015	H	0	99%	0	N	ATIH : Technical agency of hospitalization information	Linkage of hospital episodes is feasible. covers both public and private hospitals in France and the overseas districts
Germany	1	IQTIG	2015	2015	H	C	95-98% with 90% certainty	0		Federal Institute for the Quality of Medical Care	
Germany	2	Destatis	1834	2015	P	C	99.9%	0	Y	Federal Statistical Office	
Germany	3	Destatis terminations	1976	2015	P	C	99.5%	0	N	Federal Statistical Office	A special register of the Federal Bureau of statistics for terminations
Greece	1	Hellenic Statistical authority		2015	P	C		0			
Hungary	1	Hungarian Central Statistical Office	1865	2015	P	C	100%	0	Y		
Hungary	2	WHO, UNICEF, UNFPA, World Bank Group and United Nations Population Division Maternal Mortality Estimation Inter-Agency Group	1990	2015	P	C	100%	0	Y		
Hungary	3	National Health Insurance Fund of Hungary		2015	H	C	100%	0	Y		
Iceland	1	The Icelandic Birth Registration (IBR)	1972	2015	P	C	99%	0	Y		
Ireland	1	National Perinatal Reporting System (NPRS)	1985	2015	P	C	100%	0	N	The National Perinatal Reporting System (NPRS), managed by the Healthcare Pricing Office (HPO) at the Health Service Executive (HSE)	The birth notification form (BNF01) is completed where the birth takes place (either hospital/home).
Ireland	2	Central Statistical Office		2015						Central Statistics Office	link provided by SC member https://www.cso.ie/en/statistics/birthsdeathsandmarriages/ (data from online PDF)
Ireland	3	Confidential Maternal Death Enquiry Ireland		2015						National Perinatal Epidemiology Centre, Cork	link provided by SC member https://www.ucc.ie/en/npec/publications/ (data from online PDF)
Italy	1	Birth certificates (CEDAP, Certificato di assistenza al parto)	1978	2015	P	C	99%	0	N	Ministry of Health	
Italy	2	Survey on hospital discharges for spontaneous abortion	1979	2015	H	C	95%	0	N	National Institute of Statistics of Italy (ISTAT)	Data are collected using an individual form containing information on the woman and on the operation.

Country	Source N°	Source name	Start date	Data from	Type of data	Coverage	Completeness	Participation	Linked Source	Institution	Other comments on data source
Italy	3	Survey on induced abortion	1979	2015	H	C	100%	0	N	National Institute of Statistics of Italy (ISTAT)	Data are collected using an individual form containing information on the woman and on the operation.
Italy	4	Death Register before the first year of life		2015	P	C	100%	0	N	National Institute of Statistics of Italy (ISTAT)	
Italy	5	Death Register beyond the first year of life	1871	2015	P	C	100%	0	N	National Institute of Health	
Italy	6	Hospital Discharge	1995	2015	H	C	100%	0	N	Regional authorities and Ministry of Health	
Italy	7	Merged Datasource (1,2,3,4,6)							Y		
Italy	8	Merged Datasource (1,2,3,6)							Y		
Italy	9	Merged Datasource (1,2,6)							Y		
Italy	10	Merged Datasource (5,6)							Y		
Italy	11	Survey on health status and use of health services	1993	2013	P	C	100%	0	N	National Institute of Statistics of Italy (ISTAT)	The survey uses a stratified random sampling to obtain national representativeness
Latvia	1	Newbos Register of Latvia (The Medical Birth Register)	2000	2015	P	C	99%	0	Y	The Centre for Disease Prevention and Control of Latvia	Covers all deliveries, except nationals who deliver out of the country.
Latvia	2	Register of Causes of Death	1996	2015	P	C	99%	0	Y	The Centre for Disease Prevention and Control of Latvia	Also includes Latvians who have died abroad if possible
Latvia	3	The Medical Birth Register and Register of Cause of Death		2015					Y		Combined data source
Lithuania	1	Medical Date of Births	1993	2015	H	C	99%	0	N	HI HIC responsible for processing, Children's Hospital, Affiliate of Vilnius University Hospital Santariskiu Klinikos Centre of Neonatology responsible for analysing	Standard forms filled in maternity hospitals
Lithuania	2	Database of the Demographic Statistics	1994	2015	P	C	100%	0	Y	Central Statistical Office (Statistics Lithuania)	
Lithuania	3	Causes of Death register	2010	2015	P	C	100%	0	Y	Institute of Hygiene Healf Information Centre (HI HIC)	

Country	Source N°	Source name	Start date	Data from	Type of data	Coverage	Completeness	Participation	Linked Source	Institution	Other comments on data source
Luxembourg	1	Perinatal Health Monitoring System	2009	2015	H	C	100%	0	N	Luxembourg institute of Health	Available in all maternity units and liberal midwifes attending home deliveries.
Luxembourg	2	Stillbirths and early neonatal causes of death register	1967	2015	P	C	99%	0	Y	Ministry of Health - Direction of Health	
Luxembourg	3	Cause of Death Register- Registre des causes de décès du certificat de décès	1967	2015	P	C	99%	0	Y	Ministry of Health - Direction of Health	
Malta	1	National Obstetrics Information System	1999	2015	P	C	100%	V	N	Directorate for Health Information and Research	Records all births on the Maltese islands
Malta	2	National Mortality Register	1995	2015	P	C	100%	0	N	Directorate for Health Information and Research	
Norway	1	Medical Birth Register of Norway	1967	2015	P	C	99%	0	NA	The Norwegian Institute of Public Health	Includes stillbirths and livebirths 12-16 weeks GA and up.
Poland	1	Central Statistical Office	1946	2014	P	C	100%	0	N	Central Statistical Office	Birth and death certificates
Poland	2	Ministry of Health Data (Hospital discharge data MZ-29)		2014	H	C	100%	0	N	Centrum Systemów Informacyjnych Ochrony Zdrowia	
Portugal	1	National Statistics - Live births and fetal, neonatal and infant deaths	1935	2015	P	C	Almost 100%	0	N	National Statistics Institute (INE) / Department of Demographic and Social Statistis / Demographic Statistics Unit (INE/ DES/DM)	Based on routine data from birth and death certificates at a national level.
Portugal	2	Hospital Discharge Data		2015	H	C	100% of public hospitals	0	N	Central Administration of the Health System (ACSS)	Diagnosis-related Group classification according to ICD9, developed for financial purposes. We have used all cases coded as "Pregnancy, Delivery and Puerperium".
Portugal	3	Hospitals' survey	2000	2015	H	C	Almost 100%	0	N	National Statistics Institute AND General Directorate for Health	
Romania	1	National Centre for Statistics and Informatics in Public Health (NCSIPH) for maternal deaths	1945	2015		C	100%	0	N	NICSPH	
Romania	2	NIS births & NCSIPH fetal/ neonatal/infant deaths	2000	2015	H	C	100%	0	N	National Institute for Statistics data for fetal deaths. National Center for Statistics and Informatics in Public Health for fetal deaths as a modality to validate the cause of death.	National Institute for Statistics data for births and National Centre for Statistics and Informatics in Public Health for fetal/neonatal/ infant deaths

Country	Source N°	Source name	Start date	Data from	Type of data	Coverage	Completeness	Participation	Linked Source	Institution	Other comments on data source
Romania	3	NCSIPH fetal/ neonatal/infant deaths	2000	2015	H	C	100%	O	N	National Institute for Statistics data for fetal deaths. National Center for Statistics and Informatics in Public Health for fetal deaths as a modality to validate the cause of death.	National Centre for Statistics and Informatics in Public Health for fetal/neonatal/ infant deaths
Romania	4	NCSIPH DRG	2007	2015	H	O	Public hospitals only	O	Y	NCSIPH	NCSIPH data from the DRG system. Public hospitals only.
Romania	5	National Institute for Statistics demographic statistics for births	2000	2015	H	C	U	O	N	NIS	
Slovakia	1	NCZI SOR SON		2015	H	C	100%	O	N	National health information center	
Slovakia	2	Statistical Office SR		2015	P	C	100%	O	NA	Statistical office	
Slovenia	1	National Perinatal Information System of Slovenia	1986	2015	H	C	100%	O	N	Institute of Public Health	
Slovenia	2	Death certificates database		2015	P	C	U	O	NA	Institute for Public Health	
Spain	1	Vital Statistics	1858	2015	P	C	U	O	N	National Statistics Office.	Collects Vital Statistics among others statistics,
Spain	2	Minimum Data set	1997	2015	H	C	93.2%	V	N	Ministry of Health	All public hospital and around 66% of private hospitals in 2015
Spain: Catalonia	3	Register of babies	1993	2015	H	C		O	N	Subdirectorate-General for Epidemiological Surveillance and Public Health Emergency Response. Public Health Agency of Catalonia. Department of Health.	
Spain: Valencia	4	Obstetrics Medical Record Primary Care	2004	2016	O	O	60%	O	N	Regional Health Authority	
Sweden	1	Medical Birth Register	1973	2014	P	C	98%	O	Y	The National Board of Health and Welfare	All pregnancies and deliveries in Sweden
Switzerland	1	BEVNAT, statistics of natural population change (vital statistics)	1871	2014	P	C	± 100%	O	Y	Swiss Federal Statistical Office	Some underreporting of fetal deaths (including TOP) and births occurring outside the country
Switzerland	2	MS, Medical Hospital Statistics combined with data from	1998	2014	H	C	±97%	O	Y	Swiss Federal Statistical Office	National hospital data (plus some birthing homes)
Switzerland	3	The Swiss Federation of Midwifes	2005	2014	O	C	± 99%	O	N	Swiss Federal Statistical Office, Swiss Federation of Midwifes	the Swiss Federation of Midwifes (births at home and in the remaining birthing home0s)

Country	Source N°	Source name	Start date	Data from	Type of data	Coverage	Completeness	Participation	Linked Source	Institution	Other comments on data source
The Netherlands	1	Perined	1982	2015	P	C	99%	V	Y	The Netherlands Perinatal Registry	The Netherlands Perinatal Registry (PRN) includes data on pregnancies, deliveries, mothers and their babies and care process. PRN is a linked database which includes information from LVR1 (the midwife register), LVRh (the general practitioner register), LVR2 (the obstetrician register) and LNR the paediatrician and neonatologist register"
The Netherlands	2	Maternal Death Commitee of NVOG (Dutch Association of Gynaecology and Obstetrics)									
The Netherlands	3	Statistics Netherlands (municipal base administration)		2015	P	C		O			
The Netherlands	4	Survey on breastfeeding and smoking		2015						TNO	
UK_England	1	Maternity Hospital Episode Statistics	1989/90	2015	H	O:England	Many missing data items	O	N	NHS Digital	Births in private hospitals and most home births missing, but under one per cent of births are in private hospitals and under three per cent at home
UK_England	2	MIS	2015-16	2015-16	H	England	Still very incomplete	Obligatory in theory	N	National Maternity and Perinatal Audit (NMPA)	
UK_England and Wales	1	Civil registration of births and deaths linked to notification of births	2005	2014 and 2015	P	O: England and Wales	100%	O	Y	Office for National Statistics	Linkage of infant deaths to births began in 1975. Linkage of registered births to birth notifications started with a pilot in 2005, mainstreamed from 2006 onwards
UK_England and Wales	2	Civil registration of births and deaths	1837	2015	P	O: England and Wales	100%	O	N	Office for National Statistics	Registration of stillbirths began in 1927. Linkage of infant deaths to births began in 1975.
UK_NI	1	Northern Ireland Maternity System (NIMATS)	2011	2015	H	O: Northern Ireland	100%	O	N	Dept. of Health, NI	Each of the 5 HSC Trusts trusts in Northern Ireland feed into this Hospital Maternity Administration System. Data can be accessed by the Department of Health, NI.
UK_NI	2	Perinatal Death notifications to NIMACH office and MBRRACE system	2009	2015	H and P	O: Northern Ireland	100%	O	Y	MMBRACE UK	GRONI Registrar General Annual Report and Patient Administration System.
UK_NI	3	General Register Office for Northern Ireland (GRONI). Civil Registration Data. Through NISRA.	1922	2015	P	O: Northern Ireland	100%	O	N	General Register Office for Northern Ireland.	1864 – All Ireland 1922 – Northern Ireland only. GRONI statistics produced by Northern Ireland Statistics and Research Agency (NISRA) with general registration statistics reported in the Registrar General Annual Report.

Country	Source N°	Source name	Start date	Data from	Type of data	Coverage	Completeness	Participation	Linked Source	Institution	Other comments on data source
UK_Scotland	1	Composite file created by linking 3 data sources:							Y	Information Services Division of NHS National Services Scotland	Creating the composite file: SMR02 records were extracted for all live births 22+ weeks and all fetal deaths 22+ weeks (including therapeutic abortions). A data linkage was carried out to match NRS Stillbirths and Deaths (infant deaths among babies born in 2015) to the SMR02 base file.
		a) SMR02 - Scottish Morbidity Record 02 (Maternity Inpatients and Daycases)	1975	2015	H	0: Scotland	~98%	V			
		b) National Records of Scotland Stillbirths registrations	1974	2015	P	0: Scotland	100%	0			
		c) National Records of Scotland Death Registrations	1974	2015-2016	P	0: Scotland	100%	0			
UK_Scotland	2	National Records of Scotland Death Registrations	1974	2015-2016	P	0: Scotland	100%	0	N	Information Services Division of NHS National Services Scotland	All deaths (including infant and maternal) are included in this register.
UK_Wales	1	Maternity Indicators Dataset	2015	2015/2016	H	0: Wales	Any patients treated in Welsh Hospitals	0	Y	NWIS (NHS Wales Informatics Service)	
UK_Wales	2	Maternity Indicators Dataset (Birth records only)	2016	2016	H	0: Wales	U	0	N	NHS Wales Informatics Service	
United Kingdom	1	MMBRACE UK	2013	2015	P	C	Full for neonatal deaths from 20 weeks gestation. Full for stillbirths from 24 weeks gestation. We request data from 22 weeks gestation for fetal deaths but cannot confirm coverage as they are not registered deaths. We think they are fairly well completed.	0	N	University of Oxford and University of Leicester	Previous system ran from 1992 to 2010.
United Kingdom	2	Confidential Enquiry into Maternal Deaths	1928	2012-2014	P	C	100%	0	Y	MMBRACE -UK . National Perinatal Epidemiology Unit, University of Oxford	

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