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## How do late terminations of pregnancy affect comparisons of stillbirth rates in Europe? Analyses of aggregated routine data from the Euro-Peristat Project

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Running title: Impact of terminations of pregnancy on stillbirth rates

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## Abstract

**Objective:** to describe how terminations of pregnancy at gestational ages at or above the limit for stillbirth registration are recorded in routine statistics and to assess their impact on comparability of stillbirth rates in Europe.

**Design:** analysis of aggregated data from the Euro-Peristat project.

**Setting:** 29 European countries.

**Population:** births and late terminations in 2010.

**Methods:** assessment of terminations as a proportion of stillbirths and derivation of stillbirth rates including and excluding terminations.

**Main outcome measures:** stillbirth rates overall and excluding terminations.

**Results:** In 23 countries, it is possible to assess the contribution of terminations to stillbirth rates, either because terminations are rare occurrences or because they can be distinguished from spontaneous stillbirths. Where terminations were reported, they accounted for less than 1.5% of stillbirths at 22+ weeks in Denmark, between 13 and 22% in Germany, Italy, Hungary, Finland and Switzerland, and 39% in France; proportions were much lower at 24+ weeks with the exception of Switzerland (7.4%) and France (39.2%).

**Conclusions:** Terminations represent a substantial proportion of stillbirths at 22+ weeks of gestation in some countries. Countries where terminations occur at 22+ weeks should publish rates with and without terminations in order to improve international comparisons and the policy relevance of stillbirth statistics.

**Funding:** The Euro-Peristat project received funding from the European Union under the framework of the Health Programme (grant numbers: 20101301, 2007114, 2003131) and the Bridge Health Project (665691).

**Key words:** stillbirth, pregnancy terminations, registration, international comparisons, Euro-Peristat

**Tweetable abstract:** For valid comparisons of stillbirth rates, data about late terminations of pregnancy are needed.

### **Lay summary**

To compare stillbirth rates across countries, it is important to use the same rules for registering and reporting these deaths. In Europe, stillbirth statistics include babies who die before birth and are delivered starting at 22 weeks of gestation, although a cutoff of 24 weeks is used in some countries, such as the UK. One factor affecting the comparability of stillbirth statistics is whether they include spontaneous deaths as well as those after a medical termination of pregnancy because of severe birth defects or severe maternal complications. Regulations and reporting practices for terminations in late pregnancy vary between countries and may have a substantial effect on national stillbirth statistics.

Our first objective was to describe if terminations of pregnancy at or after 22 weeks are included in routine stillbirth statistics in 29 European countries participating in the Euro-Peristat project (<http://www.europeristat.com>). In 15 countries, terminations were rarely carried out after the registration cutoff (estimated at under 4% of stillbirths). In another 8 countries, pregnancy terminations were reported and could be distinguished from spontaneous stillbirths. Our first conclusion is that the contribution of terminations to stillbirths is known in most European countries, with a few exceptions.

Our second objective was to examine the impact of terminations on stillbirth rates in Europe using routine statistics. In six countries, terminations accounted for over 10% of stillbirths at 22 weeks and more. At 24 weeks or more, terminations accounted for fewer than 5% of stillbirths, except in Switzerland (7%) and France (39%). Our second conclusion is that terminations can strongly affect some countries' stillbirth rates, especially when rates are reported for births at 22 or more weeks

Based on these results, we recommend that European stillbirth rates be reported overall and excluding terminations in order to improve the comparability of stillbirth rates between countries.

## Introduction

Stillbirth rates vary widely in Europe.<sup>1</sup> In 2010 they ranged from 2.6 per 1000 in Cyprus to 9.2 per 1000 in France.<sup>1-3</sup> It is essential to ascertain whether the observed differences are artefacts arising from differences in national birth and death registration systems however, before using these results to set priorities for health policy. Countries differ in their gestational age and birth weight thresholds for birth registration, but these differences in legislation and practice for registration of stillbirths at the limit of viability do not fully explain the differences in stillbirth rates<sup>4, 5</sup>.

As there is no standardisation of criteria for reporting terminations of pregnancy (induced abortions undertaken on medical grounds), these may also contribute to international differences in stillbirth rates<sup>4, 6</sup>. Reports and studies have shown that legislation and practice for terminations in general<sup>7</sup> and those for congenital anomalies in particular<sup>8</sup> differ between European countries and may influence international comparisons of pregnancy outcome<sup>9</sup>. There are few data at a national level about rates of termination in the third trimester of pregnancy as most available data come from regional congenital anomaly registers or from specific studies.<sup>9, 10</sup> This lack of national data makes it impossible to make valid international comparisons. The importance of documenting the contribution of terminations to national stillbirth statistics was demonstrated in a recent analysis in Canada where an apparent increase in stillbirth rates was found to be due solely to an increase in rates of late termination rather than in rates of spontaneous stillbirth<sup>11</sup>.

Our objective was to describe how terminations of pregnancy at or after 22 weeks of gestational age are recorded in routine perinatal health statistics, and to assess their impact on the comparability of stillbirth rates in European countries.

## **Methods**

Data come from the Euro-Peristat project which aims to monitor maternal and child health in the perinatal period in Europe <sup>3</sup>; it is based on a collaboration between member states of the European Union and other European countries. The project team developed a common set of 30 perinatal health indicators, including stillbirth, that can be derived from routine statistics. Each country is represented by a scientific committee member who coordinates data collection, with the help of data providers. Each coordinator was requested to provide nationally aggregated data to construct the Euro-Peristat indicators and to document the way data were recorded in their routine systems and the definitions used.

### Data collection

In the most recent data collection in 2010, data on stillbirths were requested from routine sources covering the entire population of each country. If several options were available, for example a medical birth register and vital statistics from civil registration, the coordinators selected the highest quality data source for each indicator <sup>12</sup>. The United Kingdom provided data separately for England and Wales, Northern Ireland and Scotland. Data from France came from a routine national survey, based on a representative sample of births in 2010 (N=14900 births)<sup>13</sup> and the 2012 national hospital discharge statistics (N=790,000 births); this year was

chosen because inclusion of stillbirths in this database was not compulsory before 2011. Data from Cyprus were excluded because they were derived from a survey done in 2007 and data from the Czech Republic were excluded because of errors in the estimation of numbers of terminations. In all 29 countries were included in this study.

In four countries, routine statistics on stillbirths do not include terminations, but it was possible to use several data sources to derive the stillbirth indicator. Data from the national reporting system for induced abortions was added to data from the medical birth register in Finland, and to data from the perinatal quality database (AQUA) in Germany. In Norway, we used stillbirth statistics and also a linkage between the birth registry and the abortion registry to estimate the number of pregnancies which were terminated because of congenital anomalies. In Italy, three sources were used. As civil registration is restricted to births at 180 or more days of gestational age, data from the register of induced abortions were used for terminations and data from the discharge hospital statistics were used for miscarriages before 180 days of pregnancy.

Aggregated data were collected about live and stillbirths by week of gestational age. In the Euro-Peristat data collection sheets, stillbirths were defined as all deaths before or during delivery, including terminations, at or after 22 weeks of gestation. If countries could not provide data in accordance with this definition, coordinators were asked to describe the definition used. Countries were asked whether the data source(s) used for stillbirth included terminations and whether their inclusion criteria were the same as for stillbirths. Additional information about the upper gestational

age limits for carrying out terminations in the country was also requested. For this study, we contacted the scientific committee member for each country to check the legislation and practice for termination at 22+ weeks. We also used a recent review of the legislation on induced abortion in European countries <sup>7</sup>.

## Analysis

We first classified the countries based on their legislation or usual practice about the upper gestational limit for termination and the ways in which terminations were reported and included in stillbirth statistics. For the gestational age limit, we focused not only on legislation but also on the actual practice in the country. This is because, in some countries, there is no legislation, but a consensus between doctors about the upper gestational age limit for carrying out terminations. In some other countries, the legislation specifies a higher limit than that actually used in practice. For instance, in the UK (England, Wales, Scotland), there is no limit for fetuses with anomalies that lead to severe handicaps, but few terminations are carried out at or after the 24-week threshold for stillbirth registration<sup>7</sup>. Furthermore, in all countries, pregnancy termination when the mother's life is in danger is not covered by these limits.

Secondly we assessed the contribution of termination to stillbirth rates in each country by calculating the proportion of stillbirths that were terminations and stillbirth rates overall, and with terminations excluded. We used three different gestational age thresholds for stillbirths,  $\geq 22$  weeks,  $\geq 24$  weeks and  $\geq 28$  weeks, as these limits are commonly used for calculating stillbirth rates. In countries where late terminations were not legal or very rare and data were either not reported or not



available, we made the assumption that the number of stillbirths after excluding terminations was similar to the overall number of stillbirths. Because of restrictions on the way that data on induced abortions are published, it was not possible to assess the proportion of terminations among stillbirths from 24 or 28 weeks of gestation in Germany.

## Results

Table 1 classifies countries according to the gestational age limits for carrying out terminations and the reporting of terminations. In most European countries, there were no terminations or only a very small number at gestational ages above the limit for registration of fetal deaths as stillbirths. In five countries terminations were either illegal or very rare. In a further 10 countries, they were carried out only at gestational ages below the limit for stillbirth registration, which was 22 weeks in seven countries and 24 weeks in a further three.

In the countries where terminations were not rare after the registration limit for stillbirths, terminations were reported in stillbirth statistics and can be distinguished from spontaneous stillbirths in five countries. In a further three countries (Finland, Germany, Italy) they were available from a separate abortion register, not routinely aggregated with statistics on stillbirths, and were provided especially for the Euro-Peristat Project. Finally in seven countries, terminations were not registered at all or could not be distinguished from spontaneous stillbirths in the stillbirth statistics.

In the countries where pregnancies were terminated after 21 weeks of gestational age and where data were available, terminations accounted for between 1% and

22% of all stillbirths at 22 weeks or more. They accounted for less than 5% of stillbirths at 24 weeks and over and a negligible percentage of stillbirths at 28 weeks or more (Table 2). France and Switzerland were exceptions; in France, data from the hospital discharge statistics on all births in 2012, showed similar results to those obtained from the representative sample of births in 2010.

Finally, when all European countries were compared, the overall stillbirth rates at 22 weeks or more ranged from 3.2 per 1000 in Slovakia to 9.2 per 1000 in France. After excluding terminations, the stillbirth rates ranged from 2.9 per 1000 in Finland to 6.3 per 1000 in Luxembourg (Table 3). The stillbirth rates at 24 weeks or more ranged from 2.5 per 1000 in Finland to 6.9 per 1000 in France overall and from 2.5 per 1000 in Finland to 5.4 per 1000 in Latvia when terminations were excluded. The exclusion of terminations had a major impact on the international ranking of stillbirth rates at 22 weeks or more, and affected the ranking of eight countries (Fig 1). At 24 weeks or more, the impact was mainly on the rate for France which moved from the 29<sup>th</sup> and bottom position to the 18<sup>th</sup> position (Fig S1).

## **Discussion**

### *Main findings*

In most European countries, it is possible to assess the contribution of terminations of pregnancy to stillbirth rates, either because they are rare occurrences or because terminations are reported and can be distinguished from spontaneous stillbirths. When stillbirth rates are based on births at 22 or more weeks, inclusion of terminations strongly affect countries' stillbirth rates and their rankings. This effect is less marked when stillbirth rates are based on births at 24 or more weeks, and even

less so at 28 or more weeks, except for France and to a lesser degree for Switzerland.

### *Strengths and limitations*

The main strength of our study was the participation of almost all European countries and our use of population-based statistics. Data collection was based on common definitions, independent of national rules of registration. In the Euro-Peristat project, considerable attention was paid to data quality by careful checking for data inconsistencies and involvement of country representatives when clarification was needed.

Our description of practices related to late terminations by gestational age may not be completely accurate, especially where there is no system to report them. Furthermore, as an international population-based study of very preterm births showed, countries with similar legislation on the upper gestational age for terminations of pregnancy may still apply it differently<sup>9</sup>. This is unlikely to have a major impact on stillbirth rates, however, because we took into account usual practice. In countries which reported terminations and said that there were very few terminations after the gestational age limit for stillbirth registration, fewer than 2% of stillbirths were terminations. Another limitation is that results are based on data from a variety of sources. In many countries, data came from medical registries or hospital discharge systems and therefore our conclusions about the reporting of terminations may not be applicable to published national data derived from vital statistics.

### *Interpretation*

In most European countries, there are very few terminations of pregnancy after the legal gestational age limit for registration of stillbirths, mostly because of the legal threshold for terminations. In addition, the desire to avoid live births of potentially viable fetuses after late termination and the dilemmas posed by feticide may play a role. Some terminations may take place after the legal or recommended limit in exceptional circumstances, for instance where the life of the mother is under threat. These differences relate to rare events, which probably make a minimal contribution to overall stillbirth rates, however, as the data from Denmark, Northern Ireland and Norway show.

In countries where terminations are possible in some circumstances at gestational ages above the limit for registration of stillbirths, several factors can affect their frequency. The first is whether there is a gestational age limit for termination, although countries with similar legislation, for example France and Switzerland, can differ in the extent to which termination is practised. Policies on screening for congenital anomalies may also affect the numbers of late terminations. This issue was raised when second trimester routine ultrasound screening was recommended in the Netherlands<sup>14</sup> and Canada<sup>11,15</sup>. In addition routine scanning for structural anomalies occurs relatively late in Switzerland and in France<sup>8,9</sup>. As a result in France, there is a high proportion of late diagnoses of congenital anomalies<sup>16</sup> and late decisions about terminations for fetal indications<sup>17</sup>. In France, the later screening scan is justified by its improved capacity to reliably identify congenital anomalies and judge their severity. In addition some clinicians prefer later terminations to give parents time to make their decision.<sup>18</sup> The distinctive situation in France also results

from its very active screening policies and high rates of termination at all gestational ages<sup>8</sup>.

To improve international comparisons of stillbirth, it would be useful to publish statistics on the overall numbers of stillbirths as well as stillbirths excluding terminations. This is feasible since most countries are able to produce these data. Using a lower threshold of 24 weeks of gestational age would make it possible to include countries such as the UK and Portugal which have a 24 week cut-off for stillbirth registration as well as countries which have no termination data but are known to do few or no terminations after 23 weeks. This is also in line with recommendations from studies of other perinatal outcomes, such as very preterm births<sup>19</sup>. Excluding terminations may bias comparisons by favouring countries with more active screening and termination policies; for instance in 2008-2012, the rate of spontaneous stillbirths from congenital anomalies was slightly lower in France and Switzerland than in Ireland or Malta<sup>20</sup>. This question of bias applies more broadly to all countries where terminations are carried out, however, not just those with late terminations which are counted in registered stillbirth statistics, and its impact cannot be assessed.

Improvement in data are needed in many countries in order to obtain a comprehensive picture of the number of terminations and stillbirth rates excluding pregnancy terminations in Europe, especially at 22 or more weeks. Several countries did not have routine data about terminations in 2010, although Luxembourg and Slovenia started to collect them in 2013. In Finland, Germany, Italy and Norway, it was necessary to combine data from two or more sources specially for the 2010

Euro-Peristat Report to derive stillbirth rates excluding as well as including terminations,

Several of the countries where terminations are reported and also carried out after the threshold for stillbirth registration raised concerns about under-ascertainment of terminations. The quality of the data will depend on how data are collected. For example having a specific question about termination on the stillbirth certificate may be better than trying to identifying terminations from the medical causes of death on the certificates, as certifying doctors may declare the indication, for example congenital anomaly, without mentioning the termination<sup>21</sup>. The value of an abortion system may also be limited if cases are under-reported either in late pregnancy or for specific causes<sup>22, 23</sup> or if gestational age is often missing, as mentioned by several participating countries. Finally clear instructions for registration of stillbirths and defining terminations would be useful because there can be confusion between terminations and other fetal deaths, for example induction of labour for intrauterine death<sup>23</sup>.

Better ascertainment of terminations would also be useful for assessing their impact on other outcomes, specifically neonatal and infant mortality<sup>15, 24</sup>. For instance experience in the Netherlands showed that increases in numbers of terminations can reduce numbers of neonatal deaths<sup>25</sup>. In addition a more rigorous assessment of terminations, especially those for medical complications other than congenital anomalies, would be valuable for assessing practice in the extremely preterm period

9, 23 19

## **Conclusion**

Accurate data about terminations and stillbirth rates both overall and excluding terminations at 24 or more weeks are needed to improve the comparability of stillbirth rates in Europe and to inform priorities for policy making within countries.

## **Acknowledgements**

A full list of contributors to the European Perinatal Health Report: Health and Care of Pregnant Women and Babies in Europe in 2010 can be found online in Appendix S1

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## **Disclosure of interest**

The authors have no conflicts of interest to declare. The ICMJE disclosure forms are available as online supporting information.

## **Contribution to authorship**

BB and JZ discussed the design of the paper and drafted the manuscript, ADHM compiled the data provided by all members of the Euro-Peristat group, CP prepared the tables and figures. BB, MC, ADHM, MG, ML, AH, LS, KVPB, AM, JZ provided substantial input into the analysis strategy and interpretation of the data and revised the manuscript for important intellectual content. All authors approved the final version of the manuscript. JZ had overall scientific responsibility for the project.

## Ethics approval

The project was based on aggregated data collected routinely in each European country, following the ethics approval required locally.

## Funding

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### **Legends and notes for figures**

Fig 1. Stillbirth rates per 1,000 total births at or after 22 weeks in 2010

Note: For spontaneous stillbirths and unknown terminations: terminations of pregnancy were not reported in two countries although they were carried out before 24 weeks of gestational age in Romania, and irrespective of gestational age in Luxembourg.

Fig S1. Stillbirth rates per 1,000 total births at or after 24 weeks in 2010

Note: Spontaneous stillbirths and unknown terminations: when terminations were not reported, but there is no gestational age limit

Table 1. Gestational age limit for carrying out terminations of pregnancy (TOP) (1) according to national legislation or actual practice (2), and reporting of terminations of pregnancy at or after 22 weeks, in European countries in 2010

	TOP ≥ 22 wks		Reporting of late terminations
	Rare or illegal	Gestational age limit (3)	
Austria	X		No
Belgium		No	In separate database but unavailable (4)
Czech Rep		<24 wks	In stillbirth statistics and distinguishable
Denmark		<22 wks	In stillbirths statistics and distinguishable
Estonia		<22 wks	No
Finland		<24 wks	In abortion registry only
France		No	In stillbirth statistics and distinguishable
Germany		No	In abortion registry only
Greece (2009)		<25 wks	No
Hungary		No	In stillbirth statistics and distinguishable
Iceland		<23 wks	In stillbirth statistics and distinguishable
Ireland	X		No
Italy		Under viability limit	In abortion registry only (5)
Latvia		<24 wks	In stillbirths statistics but undistinguishable
Lithuania		<22 wks	No
Luxembourg		No	No (6)
Malta	X		No
The Netherlands		<24 wks	In stillbirths statistics but undistinguishable
Norway		<22 wks	In abortion registry only (7)
Poland	X		No
Portugal (8)		<24 wks	In abortion registry (9) and stillbirth statistics but undistinguishable
Romania		<24 wks	No
Slovak Rep		<22 wks	No
Slovenia		No	In stillbirth statistics but undistinguishable (6)
Spain		<22 wks	In abortion registry only
Sweden		<22 wks	In stillbirths statistics but undistinguishable
Switzerland (10)		No	In stillbirth statistics and distinguishable
UK: England and Wales (8)		<24 wks	In abortion registry and in stillbirth statistics but undistinguishable
UK: Scotland (8)		<24 wks	In stillbirth statistics but undistinguishable
UK: Northern Ireland (8)	X	<24 wks	In stillbirth statistics and distinguishable (11)

(1) Not including TOP when the mother's life is in danger.

(2) If actual practices differ from legislation, we used actual practices (see method's section).

(3) Gestational age is in completed weeks of pregnancy

(4) Separate database for terminations in the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters; data unavailable and probably incomplete

(5) Reporting of spontaneous abortions and induced pregnancy terminations in separate databases

(6) Terminations are recorded and clearly distinguishable in the medical birth register since 2013

(7) Terminations for congenital anomalies can be linked to data of medical birth register

(8) All stillbirths at 24 or more completed weeks should be registered

(9) Significant under-reporting to the abortion system.

(10) Data from the abortion system were used to supplement data from vital statistics

(11) Hospital discharge statistics

Table 2. Terminations of pregnancy as a percentage of stillbirths in Europe in 2010 by gestational age threshold, excluding countries without terminations or where terminations are not reported

Country	Total births at 22+ wks	Terminations as % of stillbirths		
		22+ wks	24+ wks	28+ wks
Denmark	63,513	1.3	0.0	0.0
France (1)	14,898	38.7	39.2	29.7
Germany (2)	638,126	18.0	-	-
Italy	547,569	17.7	0.9	0.0
Hungary	90,920	12.7	2.0	1.6
Finland	61,421	21.7	0.7	0.0
UK: England and Wales (3,4)	721,925	-	4.1	2.7
UK: Northern Ireland (3,5)	25,692	-	1.9	0.0
Norway	62,612	9.4	4.0	1.4
Switzerland	80,276	15.1	7.4	4.7

- cannot be calculated

(1) National representative sample of births. In hospital discharge statistics in 2012 (N=792,842), the proportion of terminations was: 41.2%, 41.4% and 31.2% respectively in stillbirths at 22+, 24+ and 28+ weeks

(2) Terminations at 24+ and 28+ weeks are not published

(3) Registration of stillbirths at 24+ weeks

(4) Data on terminations are derived from abortion notifications

(5) Hospital discharge statistics

Table 3. Stillbirth rates per thousand births overall and excluding terminations of pregnancy in Europe in 2010 by gestational age threshold (1)

	22+ weeks		24+ weeks		28+ weeks	
	Overall	Excluding terminations	Overall	Excluding terminations	Overall	Excluding terminations
Austria	3.7	3.7	3.0	3.0	2.5	2.5
Belgium	5.8	-	4.5	-	3.2	-
Denmark	3.8	3.7	2.9	2.9	2.3	2.3
Estonia	4.3	4.3	3.3	3.3	2.7	2.7
Finland	3.7	2.9	2.5	2.5	2.0	2.0
France (2)	9.2	5.6	6.9	4.2	4.3	3.1
Germany	4.0	3.3	-	2.9	-	2.3
Greece (2009)	-	-	4.5	-	-	-
Hungary	6.6	5.7	4.4	4.3	3.4	3.4
Iceland	3.5	3.5	3.1	3.1	1.8	1.8
Ireland	4.7	4.7	4.3	4.3	3.7	3.7
Italy	4.6	3.8	3.0	3.0	2.4	2.4
Latvia	5.7	-	5.4	5.4	4.1	4.1
Lithuania	4.7	4.7	4.4	4.4	3.4	3.4
Luxembourg	-	6.3	-	4.7	-	2.9
Malta	4.5	4.5	4.0	4.0	3.5	3.5
The Netherlands	5.7	-	3.9	3.9	2.9	2.9
Norway	3.7	3.4	2.8	2.7	2.3	2.3
Poland	4.1	4.1	3.6	3.6	3.0	3.0
Portugal	-	-	3.1	3.1	2.4	2.4
Romania	-	4.0	4.0	4.0	4.0	4.0
Slovak Rep	3.2	3.2	3.2	3.2	3.1	3.1
Slovenia	5.3	-	4.6	-	3.3	-
Spain	3.7	3.7	3.0	3.0	2.6	2.6
Sweden	3.7	3.7	3.3	3.3	2.8	2.8
Switzerland	4.3	3.6	3.0	2.8	2.1	2.0
UK: England and Wales	-	-	5.0	4.8	3.8	3.8
UK: Northern Ireland	-	-	4.2	4.1	3.4	3.4
UK: Scotland	-	-	5.1	5.1	3.6	3.6

(1) In countries without data on terminations of pregnancy but they are known to be illegal or uncommon, we assumed that the number of stillbirths after excluding terminations was similar to the overall number of stillbirths

(2) National representative sample of births. In hospital discharge statistics in 2012 (N=792,842), stillbirth rates per thousand births overall and excluding terminations were 8.8 and 5.2 at 22+ weeks, 6.7 and 3.9 at 24+ weeks and 3.8 and 2.3 at 28+ weeks.

