

Assisted reproductive technology in Europe, 2008: results generated from European registers by ESHRE[†]

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BACKGROUND: This 12th European IVF-monitoring (EIM) report presents the results of treatments involving assisted reproductive technology (ART) initiated in Europe during 2008.

METHODS: From 36 countries (3 more compared with 2007), 1051 clinics reported 532 260 treatment cycles including: IVF (124 539), ICSI (280 552), frozen embryo replacements (FER, 97 120), egg donation (ED, 13 609), *in vitro* maturation (IVM, 562), preimplantation genetic diagnosis/screening (PGD/PGS, 2875) and frozen oocyte replacements (FOR, 4080). Overall, this represents a 7.9% increase in the activity since 2007, which is mainly related to an increase in cycles from almost all registers and only partially to the new countries entering EIM (Estonia, Kazakhstan, Moldova and Romania, 5480 cycles in total). European data on intrauterine insemination using husband/partner's (IUI-H) and donor (IUI-D) semen were reported from 27 and 21 countries, respectively. A total of 144 509 IUI-H (+1.5%) and 24 960 IUI-D (−4.3%) cycles were included.

RESULTS: In 19 countries where all clinics reported to the ART register, a total of 350 143 ART cycles were performed in a population of 369.8 million, corresponding to 947 cycles per million inhabitants. For IVF, the clinical pregnancy rates per aspiration and per transfer were 28.5 and 32.5%, respectively, and for ICSI the corresponding rates were 28.7 and 31.9%. In FER cycles, the pregnancy rate per thawing was 19.3%. The delivery rate after IUI was 9.1% for IUI-H and 13.8% for IUI-D. In IVF and ICSI cycles, one, two, three and four or more embryos were transferred in 22.4, 53.2, 22.3 and 2.1%, respectively. The proportions of singleton, twin and triplet deliveries after IVF and ICSI (combined) were 78.3, 20.7 and 1.0%, respectively, resulting in a total multiple delivery rate of 21.7%, compared with 22.3% in 2007, 20.8% in 2006 and 21.8% in 2005. In FER cycles, the multiple delivery rate was 13.7% (13.4% twins and 0.3% triplets). In women undergoing IUI, twin and triplet deliveries occurred in 10.6% and 0.7% with IUI-H and in 9.4 and 0.3% with IUI-D, respectively.

CONCLUSIONS: In comparison with previous years, there was an increase in the reported number of ART cycles in Europe. For the first time in 5 years, the pregnancy rates failed to show a year-on-year increase. Compared with 2007, the number of transfers of multiple embryos (3+) and a multiple delivery rate showed a marginal decline.

Key words: European Society of Human Reproduction and Embryology / IVF; ICSI / intrauterine insemination / register data / Europe

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[‡]EIM Committee 2011–2013: Chairman: A.P. Ferraretti; Chairman elect: M. Kupka; Past chairman: J. de Mouzon. Members: A. Nyboe Andersen (special advisor), S. Bhattacharya, J.A. Castilla, V. Korsak, and K.G. Nygren. V. Goossens is Science Manager at ESHRE Central Office, Brussels. See also Appendix for contributing centres and contact persons representing the data collection programmes in the participating European countries.

Introduction

This report is the 12th annual European Society of Human Reproduction and Embryology (ESHRE) publication on European data on assisted reproductive technology (ART). The 11 previous reports, also published in *Human Reproduction* (ESHRE, 2001a,b, 2002, 2004, 2005, 2006, 2007, 2008; Nyboe Andersen et al., 2009; de Mouzon et al., 2010; de Mouzon et al., 2012), covered treatment cycles from 1997 to 2007. As in the last report, the printed version contains the four most significant tables. Additional tables are available online, making the whole report consistent with those from previous years. In the published report, these online tables will be referred to as 'Supplementary data, Tables SI–SXVIII'. The main results of this report were presented at the annual ESHRE congress in Stockholm, July 2011.

Materials and Methods

Data collection

Data on ART have been collected from 36 European countries, covering IVF, ICSI, frozen embryo replacement (FER), egg donation (ED), *in vitro* maturation (IVM), pooled data on preimplantation genetic diagnosis (PGD) and preimplantation genetic screening (PGS) and frozen oocyte replacements (FOR). In addition to ART, data on intrauterine inseminations using husband/partner's semen (IUI-H; 27 countries, 5 more than in 2007) and donor semen (IUI-D; 21 countries, 3 more than in 2007) were also included. The report includes treatments started between the 1st of January and the 31st of December 2008. Data on pregnancy outcomes are derived from the follow-up of the cohort treated during this time period.

The method of reporting used for 2008 data is similar to that used for the previous year, making all tables comparable. However, the Consortium agreed to add an optional module for data collection on cycles performed for cross-border patients. As in previous years, data were directly entered in ESHRE's computer system by each country co-ordinator, through software developed by ESHRE. Data analysis was performed in the ESHRE central office by V. Goossens.

As is evident in the tables and underlined in the footnotes, registers from a number of countries have been unable to provide some of the data requested. Therefore, each total (in terms of numbers and percentages) refers to those countries where all data have been reported. Some countries did not report the number of initiated cycles; several countries had a high percentage of pregnancies lost to follow-up. Therefore, some of the best indicators in reporting outcomes (clinical pregnancies and deliveries per initiated cycles) cannot be reported correctly and caution should be exercised in comparing outcomes among countries.

Results

Participation

The present report includes data from 36 (Table I) out of 47 European countries. Since the first report for 1997, the number of countries contributing data has doubled. Compared with 2007, four new countries (Estonia, Kazakhstan, Moldova and Romania) entered the Consortium but Cyprus was not able to send data. The proportion of clinics reporting data (listed in the Supplementary data) was 84.5% (86% in 2007). In 19 countries (one more compared with 2007) the coverage reached 100%. Switzerland was able to report data from all but a single centre. Participation was limited (25–50%) in

Albania, Lithuania, Romania and Serbia and very low ($\leq 25\%$ of clinics) in Greece (12%), Kazakhstan (17%), Bosnia (20%) and Latvia (25%). Among the most populous countries, the coverage was 100% (similar to 2007) in Germany, Italy, UK and Turkey, 95% in France (100% in 2007), 74% in Russia (79% in 2007) but only 50% in Spain (61% in 2007).

Reporting methods and size of the clinics

Among the 19 countries with complete reporting (Supplementary data, Table SII), the register was compulsory for 14 (10 held by a National Health Authority and 4 by a Medical Organization) and voluntary for 5 (4 held by a Medical Organization and 1 by personal initiative). Only seven registers were based on individual forms, i.e. cycle-by-cycle data.

Among the 17 countries with partial coverage, 4 were compulsory (2 held by a National Health Authority and 2 by a Medical Organization) and 13 voluntary and only 3 used individual forms.

The distribution of clinics according to the number of cycles varied considerably among the countries (Supplementary data, Table SIII). For instance, small clinics, providing fewer than 100 cycles annually, accounted for 88 out of 207 clinics in Italy (42.5%) and 4 out of 10 (40%) in Bulgaria, whereas large clinics performing > 1000 cycles a year, constituted 12/18 (66.7%) in Belgium, 2/3 (66.7%) in Slovenia and 8/13 (61.5%) in the Netherlands. The only clinic reporting from Kazakhstan performed over 1000 cycles.

Number of treatment cycles per technique and availability

In total, 532 260 cycles were reported (Table I), 39 076 more than in 2007 (+7.9%). Among the 405 091 fresh cycles, 124 539 were IVF and 280 552 were ICSI. The proportion of ICSI thus continued to increase, reaching 69% of fresh ART cycles (68% in 2007). In Turkey, 98% were ICSI cycles; in two countries (Bosnia and the Czech Republic) IVF and ICSI was most often combined.

FER was performed in 32 countries, reporting 97 120 cycles (+5975 compared with 2007). Overall, the proportion in comparison with 'fresh' cycles was 24.0% (the same as in 2007) but in some countries the proportion was $> 50\%$ (Switzerland, Finland, Latvia, Iceland and Belgium).

The number of ED cycles, reported by 24 countries, was 13 609 (–2122 compared with 2007).

Table I also shows the number of cycles per million women of reproductive age (15–45 years) and per million inhabitants, in the 19 countries where data coverage was 100%. Details are reported in Supplementary data, Table SI.

Pregnancies and deliveries after treatment

Table II shows the pregnancy and delivery rates per aspiration for IVF, ICSI and FER. One country (Turkey) could not provide pregnancies and deliveries subdivided per technique (IVF and ICSI), one country (Austria) only provided data on pregnancy/transfers and no data on deliveries, and three countries (Czech Republic, Latvia and Poland) did not provide data on deliveries. Thus, the mean pregnancy and delivery rates were computed for countries providing the relevant information. There were significant national variations in clinical outcomes. On average, the pregnancy rates were 28.5% (–0.6% compared with

Table I ART in European countries in 2008.

	IVF clinics in the country		Treatment cycles ^a								Cycles/million ^b	
	Total	Reporting	IVF	ICSI	FER	ED	IVM	PGD	FOR	All	Women 15–45 years	Population
Albania	4	1	61	85	1	17				164		
Austria	26	26	1009	4210	444					6540	3933	779
Belgium	18	18	4128	12 712	8870	820				28 751	13 069	2687
Bosnia	5	1		180	0	0	0	0	0	180		
Bulgaria	17	10	844	2189	167	90		7		3297		
Czech Republic	30	30		12 438	4774	2038		357		19 607	9039	1885
Denmark	20	20	5672	4806	2610	228	49	111	0	13 476	12 712	2450
Estonia	4	4	590	1057	531	81	0	0	0	2259	8176	1738
Finland	19	19	2925	2027	3274	415	16	15	325	8997	9291	1698
France	105	100	19 789	31 745	15 782	663	76	391		68 446		
Germany	120	120	11 264	35 167	17 646					69 902	4678	780
Greece	50	6	435	1652	275	91	0	8	15	2476		
Hungary	12	7	504	2061	578	41	0	5	8	3197		
Iceland	1	1	221	190	227	62	0	0	0	700	10 790	2333
Ireland	7	5	1740	1068	672	9	0	0	0	3489		
Italy	207	207	8726	35 311	508		0		3284	47 829	3974	798
Kazakhstan	6	1	778	227	317	140		3		1465		
Latvia	4	1	116	60	111	53	0	0	0	340		
Lithuania	4	2	219	202	42					463		
Macedonia	4	4	603	899	34					1536	3361	768
Moldova	1	1	267	346						613	589	150
Montenegro	3	3	28	309	33					370	2512	617
Norway	11	11	2882	3069	2574		10		0	8535	9287	1778
Poland	–	22	282	6462	3058	355	124	198	11	10 490		
Portugal	22	22	1422	3171	675	194	4	103	0	5569	2544	525
Romania	12	4	792	165	130	21	35	0	0	1143		
Russia	85	63	15 064	10 199	3481	1666	176	411	220	31 217		
Serbia	12	6	930	630		14				1574		
Slovenia	3	3	972	1988	699	5	14	25	2	3705	8940	1853
Spain	182	90	2977	23 269	6997	4068	14	721	199	38 245		
Sweden	16	16	5789	5221	4733	273	2	89		16 107	9228	1751
Switzerland	26	25	997	3887	3593		0		0	8477		
The Netherlands	13	13	8987	7940	4237					21 164	6382	1290

Continued

Table 1 Continued

IVF clinics in the country	Treatment cycles ^a					Cycles/million ^b						
	Total	Reporting	IVF	ICSI	FER	ED	IVM	PGD	FOR	All	Women 15–45 years	Population
Turkey	107	107	885	43 043						43 928	2397	587
Ukraine	18	12	2802	2930	1090	553		79		7454		
United Kingdom	70	70	19 839	19 637	8957	1712	42	352	16	50 555	4066	825
All	1244	1051	124 539	280 552	97 120	13 609	562	2875	4080	532 260	4661	947

^aTreatment cycles in IVF and ICSI should refer to initiated cycles. For Austria and Germany, the total number of cycles is higher than the sum of initiated cycles for fresh cycles only globally. Therefore, in the overall calculation, the total number of cycles is not equal to the sum of cycles per technique. For Belgium, France, Germany, Iceland, Kazakhstan, Lithuania and Turkey treatment cycles refer to aspirations, for Austria they refer to transfers. Bosnia-Herzegovina and the Czech Republic almost always perform IVF in combination with ICSI. For Belgium there are 506 cycles for which it is not known whether IVF or ICSI was performed. Treatment cycles in FER refer to thawing. For Austria, Finland, France, Lithuania and The Netherlands treatment cycles refer to transfers. For Kazakhstan they refer to donation cycles. For Kazakhstan treatment cycles refer to aspirations. For France they refer to transfers. Treatment cycles in PGD refer to initiated cycles. For Kazakhstan they refer to aspirations. Treatment cycles in IVM refer to aspirations. Treatment cycles in FOR refer to thawing, for Finland they refer to transfers.

^bCycle per million calculated for the countries with 100% of clinics participating.

2007) and 28.7% (+0.1%) per aspiration for IVF and ICSI, respectively, and 19.3% per thawing for FER (−0.8%), while the mean delivery rates per aspiration (per thawing for FER) were 21.2, 20.4 and 13.7%, respectively (+0.1%, +0.2% and +0.2%). The detailed numbers of cycles, aspirations, transfers, pregnancies, deliveries and the corresponding rates per technique in each country are reported in [Supplementary data, Table SIV](#) for IVF, [Supplementary data, Table SV](#) for ICSI and [Supplementary data, Table SVI](#) for FER. Turkey reported combined IVF and ICSI outcome, with a pregnancy rate of 36% per aspiration and 40% per transfer; only 4028 deliveries were recorded out of 15 886 pregnancies, giving a recorded delivery rate of 9.2% per aspiration and 10% per transfer.

As shown in [Supplementary data, Tables SXII and SXIII](#), several countries had difficulties in gathering full pregnancy outcome. Overall, the pregnancies lost to follow-up were 18.6% for IVF and ICSI (21 285/114 665) and 7.4% for FER (1418/19 123).

Numbers of documented pregnancy losses (spontaneous abortions) were reported by 33 countries for IVF and ICSI and by 28 countries for FER ([Supplementary data, Tables SXII and SXIII](#)). In these countries, the rates varied from 10 to 35% for fresh cycles (a mean of 18.5%) and from 11 to 37% for FER (a mean of 24%). The figures may be underestimated because of pregnancies lost to follow-up. In the 16 countries with complete follow-up, the figures were 20.6% for fresh cycles (5741/27869) and 27% for FER (1643/5986).

In total, 107 383 infants were recorded as having been born as a consequence of IVF, ICSI and FER in the 33 countries where the reporting included newborns (+10 693 compared with 2007). In the countries with 100% coverage with relevant data, the percentage of babies conceived through ART on the national births varied from 0.5% in Turkey to 4.6% in Denmark. More details are provided in [Supplementary data, Table SI](#), showing that the percentage of ART babies was above 3.0%, in most of the Nordic countries, and between 1.3 and 1.9% in some of the largest European countries (Germany, UK and Italy).

In Finland, Iceland and Switzerland, one out of three ART infants was born after FER.

ED was reported by 24 countries ([Supplementary data, Table SVII](#)). In most of the countries where data were not reported, the technique was illegal. In total, 5213 clinical pregnancies resulted from 10 601 embryo transfers with pregnancy rates of 43.2% per transfer versus 46.2% in 2007. The mean delivery rate was 30.8% per transfer ($n = 3243$) in the 22 countries reporting deliveries.

Age distribution

The age distribution of women treated with IVF and ICSI varied across countries ([Supplementary data, Tables SVIII and SIX](#)). The highest percentages of women aged 40 years or more were found in Greece and Italy, whereas the highest percentages of women aged 34 years or less were found in countries from East Europe. As expected, the pregnancy rates associated with IVF and ICSI decreased with advancing age. The same trend was seen for delivery rates. FER cycles ([Supplementary data, Table SX](#)) included a relatively higher percentage of young women (≤ 34 years) and, as in fresh cycles, pregnancies and deliveries rates decreased with age. In ED cycles ([Supplementary data, Table SXI](#)), the age of the recipient was 40 years or more in 54.4% of cases on average, and few countries reported a figure less than

Table II Results after ART in 2008.

Country	Initiated cycles IVF + ICSI	IVF			ICSI			FER			ART infants ^b	ART infants per national births (%)
		Aspirations	Pregnancies per aspiration (%)	Deliveries per aspiration (%)	Aspirations	Pregnancies per aspiration (%)	Deliveries per aspiration (%)	Thawings FER	Pregnancies per thawing (%)	Deliveries per thawing (%)		
Albania	146	59	37.3	28.8	84	44.0	31.0	1	0.0	0.0	68	
Austria	6096											
Belgium	19 061	4128	28.9	20.3	12 712	26.8	18.8	8870	17.5	12.1	4971	3.9
Bosnia	180				167	33.5	18.0				32	
Bulgaria	3033	750	37.1	30.0	2141	34.1	28.9	167	16.2	13.2	1158	
Czech Republic	12 438				11 788	32.4		4774	13.2			
Denmark	10 478	5476	25.1	20.5	4733	27.2	22.8	2610	16.2	12.5	3004	4.6
Estonia	1647	569	38.0	30.2	1051	33.7	27.2	531	16.2	11.9	649	4.1
Finland	4952	2869	26.7	19.8	2002	27.6	20.6				1835	3.1
France		19 789	23.5	18.4	31 745	25.9	20.7				14 475	
Germany	50 828	11 264	26.9	16.7	35 167	26.7	16.9	17 646	17.3	10.7	11 769	1.7
Greece	2087	410	24.9	18.0	1571	21.4	16.5	275	14.9	9.5	464	
Hungary	2565	427	34.2	25.3	2004	36.5	29.9	578	20.8	19.7	1020	
Iceland		221	21.7	19.9	190	22.1	19.5	227	30.4	23.8	178	3.7
Ireland	2808	1512	29.1	24.7	916	31.3	26.7	672	17.6	13.5	873	
Italy	44 037	7452	23.0	15.2	31 982	22.3	15.0	508	20.5	10.6	7565	1.3
Kazakhstan		778	35.7	29.0	227	33.5	26.0				513	
Latvia	176	116	40.5		60	36.7		111	14.4			
Lithuania		219	24.2		202	31.2					26	
Macedonia	1502	578	31.1	24.7	846	35.6	29.9	34	20.6	17.6	554	2.4
Moldova	613	252	41.7	35.7	330	46.4	39.1				276	0.7
Montenegro	337	23	60.9	52.2	301	34.6	31.2	33	15.2	12.1	145	1.8
Norway	5951	2728	29.9	25.4	2957	27.4	23.7	2574	17.3	14.0	1958	
Poland	6744	267	36.0		6322	38.8		3058	23.0	13.6	2790	
Portugal	4593	1276	33.2	24.8	2921	28.8	22.6	675	19.3	14.5	1382	1.3
Romania	957	790	28.7		164	35.4		130	11.5		53	

Continued

Table II Continued

Country	Initiated cycles IVF + ICSI	IVF			ICSI			FER			ART infants ^b	ART infants per national births (%)
		Aspirations	Pregnancies per aspiration (%)	Deliveries per aspiration (%)	Aspirations	Pregnancies per aspiration (%)	Deliveries per aspiration (%)	Thawings FER	Pregnancies per thawing (%)	Deliveries per thawing (%)		
Russia	25 263	14 483	34.2	23.3	9983	32.0	21.5	3481	24.8	16.0	8304	
Serbia	1560	907	24.5	17.3	596	34.6	29.9				390	
Slovenia	2960	915	28.0	21.7	1947	30.5	24.8	699	21.0	16.0	950	4.4
Spain	26 246	2565	31.5	18.4	20 957	34.6	20.0	6997	22.7	12.2	8745	
Sweden	11 010	5396	30.4	23.8	4930	28.0	22.3	4733	23.4	18.0	3521	3.3
Switzerland	4884	914	24.5	18.2	3605	26.5	19.1	3593	19.6	13.9	1610	
The Netherlands	16 927	8208	27.0	19.6	7502	29.5	22.5				4487	2.4
Turkey		885			43 043						5772	0.5
Ukraine	5732	2713	35.5	26.0	2895	36.4	30.8	1090	26.5	21.1	2613	
United Kingdom	39 476	16 936	30.7	26.8	19 620	31.8	28.2	8957	20.8	18.2	15 233	1.9
All ^a	315 287	115 875	28.5	21.2	224 618	28.7	20.4	73 024	19.3	13.7	107 383	1.6

^aTotal rates refer to these countries where all data were reported for the given technique.

^bART infants also include ED. For IVF and ICSI there were for France, Greece, Poland, Romania and Russia respectively 106, 6, 39, 31 and 345 deliveries with unknown outcome. These were accepted as singletons to calculate the ART infants. For FER there were for Greece, Poland, Portugal, Russia and Switzerland respectively 1, 7, 1, 3 and 3 deliveries with unknown outcome. These were accepted as singletons to calculate the ART infants. For ED there were for Russia 6 deliveries with unknown outcome. These were accepted as singletons to calculate the ART infants. For PGD there were for Finland and Russia respectively 3 and 1 deliveries with unknown outcome. These were accepted as singletons to calculate the ART infants. For Lithuania % deliveries removed.

40% : Belgium (39.7%), Bulgaria (39.3%), Denmark (23.2%), Estonia (33.3%) and Sweden (8.1%). Pregnancy and delivery rates in oocyte recipients were comparable across different age groups.

Number of embryos transferred and multiple births

Table III shows the number of embryos transferred after IVF and ICSI combined. In countries with complete information, the total proportion of single embryo transfers (SETs) was 22.4% (21.4% in 2007). Double embryo transfers (DETs) occurred in 53.2% (53.4% in 2007), triple embryo transfers in 22.3% (22.7% in 2007) and 4 or more embryos were transferred in 2.1% (2.5% in 2007). Information about numbers of elective single transfers is not yet available. As shown in Table III, major differences were seen between countries. In 2008, five countries reported a SET rate of >50%: Sweden (69.5%), Finland (62.1%), Norway (52.9%), Bosnia (52%) and Belgium (50.4%). The proportion of triple embryo transfers ranged from zero in Sweden and <1% in Finland and Norway to ≥50% in Montenegro, Macedonia, Moldova and Turkey. Transfer of four or more embryos ranged from 0 in 15 countries (and <1% in 5 countries) to 41.8% in Lithuania.

In fresh cycles, the percentages of multiple deliveries were 20.7% for twins (21.3% in 2007) and 1.0% for triplets (1.0% in 2007). After FER, the percentages were 13.4% for twin deliveries (13.1% in 2007) and 0.3% for triplet deliveries (0.3% in 2007). Additional data on pregnancy outcome, singleton and multiple deliveries are provided in [Supplementary data, Table SXII](#) (for fresh cycles) and [Supplementary data, Table SXIII](#) for FER. In ED, out of 3224 deliveries with known data, 862 were twins (26.7%) and 43 were triplets (1.3%; data not presented in tables).

Perinatal risks and fetal reductions

[Supplementary data, Table SXIV](#) shows the risk of preterm deliveries according to the number of newborns. Data were available from 17 countries. These show that the risk of extreme preterm birth (gestational week 20–27) increased from 0.8% for a singleton delivery to 3.2% for twins and 5.9% for triplets. The same trend was noted for a singleton delivery, twins and triplets for very preterm (28–32 weeks) births, from 1.9% to 10.0% and 32.4%, respectively, and for preterm (33–36 weeks) births, from 8.5% to 41.5% and 54.4%, respectively.

Ovarian hyperstimulation syndrome (OHSS) was reported in 30 of the 36 countries ([Supplementary data, Table SXV](#)). In total, 2947 cases of OHSS were recorded, corresponding to a risk of OHSS of 1.0% of all stimulated cycles in the countries reporting the data. The table also includes other adverse outcomes, such as bleeding (652), infection (49) and fetal reductions (394).

PGD/screening

PGD/PGS activity, recorded from 16 countries (14 in 2007), involved 2875 cycles, 2691 aspirations, 2082 embryo transfers and 411 deliveries (15.3% per aspiration), the main contributor being Spain with 721 cycles.

In vitro maturation

IVM was recorded in 12 countries (Table I). A total of 562 aspirations (660 in 2007 and 241 in 2006) and 453 transfers were recorded, resulting in 103 pregnancies and 47 deliveries.

Frozen oocyte replacement

FOR was recorded by the same nine countries of 2007 report, with a total of 4080 thaws, 3359 transfers, 556 pregnancies and 358 deliveries. The majority (80%) was performed in Italy.

Intrauterine inseminations

Table IV provides data on IUI-H (reported by 27 countries) and IUI-D (reported by 21 countries).

For IUI-H, 144 509 cycles were reported (+1900); the main contributors being Denmark, France, Italy, Spain and the UK. Among the countries reporting deliveries, the mean delivery rate was 9.1% per cycle (−0.1%) with 10.6% of deliveries being twin (−0.8%) and 0.7% triplet deliveries (+0.1%).

For IUI-D, 24 960 cycles were reported (−1128), the main contributors being Denmark, France, Spain and UK. The delivery rate was 13.8% per cycle (equal to 2007), with multiple delivery rates of 9.4% for twins and 0.3% for triplets.

Data are presented on IUI outcomes in women below 40 years (upper panel) and 40 years or more (lower panel), both for IUI-H ([Supplementary data, Table SXVI](#)) and IUI-D ([Supplementary data, Table SXVII](#)). The delivery rate associated with IUI-H declined with age (10.5% below 40 versus 5.5% above), and the multiple delivery rate decreased slightly from 11.0 to 8.8% for twins, and from 0.8 to 0.0% for triplets. Similar findings were seen in IUI-D, where delivery rates decreased from 13.5 to 6.6%, twin deliveries from 9.5 to 3.7% and triplets from 0.3 to 0.0%.

Cumulative delivery rates

[Supplementary data, Table SXVIII](#) gives an estimate of the cumulative delivery rates per initiated stimulated cycle, presented as the sum of fresh and FER pregnancies obtained during the same year. While not a true cumulative delivery rate per couple per cycle, the calculation shows that the delivery rate (fresh versus cumulative) can increase in countries reporting the relevant data. Overall, the increase was from 19.4 to 22.5% (+16%) but in some countries (Switzerland, Finland, Sweden and Belgium) the increment was more substantial (+58%, +54%, +35%, +33%, respectively). Additionally, [Supplementary data, Table SXVIII](#) shows the rate of multiple deliveries after the 'fresh' cycles and the FER combined. The overall multiple delivery rate was particularly low in Sweden and Finland: 6.6% and 9.7%, respectively, with relatively high cumulative delivery rates (29.4% and 30.5%)

Cross-border reproductive care

Seven countries reported data on cross-border patients: Iceland, Kazakhstan, Latvia, Macedonia, Poland, Slovenia and Spain. They reported 2512 ART cycles, of which 1040 were performed for egg donation, 58 for semen donation, 32 for PGD and the other cycles for IVF/ICSI with the couple's own gametes. Additionally 86 IUI cycles with sperm donation were reported. Overall, they represent 4.6%

Table III Number of embryos transferred and deliveries after ART in 2008.

Country	IVF + ICSI					FER					
	Transfers	1 embryo (%)	2 embryos (%)	3 embryos (%)	4+ embryos (%)	Deliveries	Twin (%)	Triplet (%)	Deliveries	Twin (%)	Triplet (%)
Albania	139	5.0	23.7	71.2	0.0	43	32.6	4.7	0		
Austria	5219	22.6	68.9	8.3	0.2						
Belgium	15 343	50.4	39.8	8.1	1.6	3231	11.5	0.2	1070	13.3	0.4
Bosnia	150	52.0	40.7	7.3	0.0	30	6.7	0.0	0		
Bulgaria	2701	17.9	28.8	39.6	13.6	844	26.3	1.8	22	9.1	0.0
Czech Republic	10 332	19.6	70.6	9.6	0.2						
Denmark	8751	39.6	54.1	6.3	0.0	2201	16.6	0.1	327	9.8	0.3
Estonia	1511	21.1	72.7	6.2	0.0	458	23.8	0.4	63	17.5	3.2
Finland	4392	62.1	37.7	0.2	0.0	983	9.3	0.0	529	10.0	0.4
France	43 544	26.1	61.1	11.9	0.9	10 205	18.2	0.4	1931	9.8	0.1
Germany	43 336	12.5	67.6	19.9	0.0	7818	20.8	0.9	1890	14.8	0.4
Greece	1687	19.0	25.5	46.9	8.5	333	22.0	1.8	26	12.0	0.0
Hungary	2247	7.3	59.0	29.1	4.6	707	19.8	1.4	114	18.4	0.9
Iceland	334	48.5	45.8	5.7	0.0	81	11.1	0.0	54	20.4	0.0
Ireland	2207	19.1	72.6	8.2	0.1	618	20.6	1.3	91	12.1	1.1
Italy	34 179	20.0	30.7	49.4	0.0	5928	21.2	2.7	54	16.7	0.0
Kazakhstan	947	13.9	49.0	33.8	3.3	285	28.4	1.4	51	29.4	0.0
Latvia	169	15.4	59.2	25.4	0.0						
Lithuania	67	3.0	9.0	46.3	41.8	17	29.4	5.9	2	0.0	0.0
Macedonia	1172	16.7	24.8	56.7	1.8	396	28.8	4.8	6	0.0	0.0
Moldova	551	7.8	24.0	56.1	12.2	219	24.2	0.9			
Montenegro	304	12.5	22.4	58.2	6.9	106	31.1	0.0	4	50.0	0.0
Norway	5055	52.9	46.4	0.8	0.0	1393	12.0	0.2	360	8.9	0.0
Poland	5963	18.2	68.2	12.9	0.7	1748	20.4	0.5	416	18.3	0.7
Portugal	3779	19.0	69.6	11.4	0.0	976	20.5	0.1	98	18.6	0.0
Romania	891	8.8	39.6	42.2	9.4	46			6		
Russia	22 511	15.6	59.9	20.3	4.2	5522	23.0	1.1	558	20.7	0.5
Serbia	1275	13.3	77.1	6.9	2.7	335	9.0	3.3			
Slovenia	2492	30.4	67.0	2.6	0.0	681	18.9	0.4	112	12.5	0.0
Spain	21 042					4666	23.8	0.9	854	18.6	0.5
Sweden	9161	69.5	30.5	0.0	0.0	2386	7.0	0.1	854	5.2	0.1
Switzerland	3970	14.7	66.8	18.6	0.0	856	20.2	0.5	498	14.3	0.4
The Netherlands	13 972					3299	13.9	0.1	652	10.7	0.0
Turkey	39 619	12.8	24.4	52.8	10.1	4028	32.9	5.2			
Ukraine	5189	11.5	44.7	38.2	5.7	1598	27.2	0.5	230	22.6	0.0
United Kingdom	33 558	15.4	79.4	5.1	0.0	10 078	24.5	0.4	1630	14.9	0.1
All ^a	312 745	22.4	53.2	22.3	2.1	72 115	20.7	1.0	12 502	13.4	0.3

^aTotals refer only to these countries where data on number of transferred embryos and on multiplicity were reported. Belgium: for one delivery it is not known whether IVF or ICSI is performed. Denmark: no data on multiplicity for IVF + ICSI and FER. Romania: scanty data on multiplicity for fresh cycles and no data on multiplicity for FER. Percentages are calculated on numbers of known multiplicity.

Table IV Intrauterine insemination with IUI-H or IUI-D semen in 2008.

Country	IUI-H						IUI-D					
	Cycles	Deliveries	Deliveries (%)	Singleton (%)	Twin (%)	Triplet (%)	Cycles	Deliveries	Deliveries (%)	Singleton (%)	Twin (%)	Triplet (%)
Albania	43	4	9.3	100.0	0.0	0.0						
Austria												
Belgium												
Bosnia	91	9	9.9	88.9	11.1	0.0						
Bulgaria	1538	124	8.1	93.5	6.5	0.0	396	50	12.6	94.0	6.0	0.0
Czech Republic												
Denmark	9353	1133	12.1	87.5	11.6	0.9	7116	942	13.2	91.6	8.3	0.1
Estonia	155	6	3.9	100.0	0.0	0.0	111	3	2.7	100.0	0.0	0.0
Finland	3753	336	9.0	90.8	9.2	0.0	629	96	15.3	95.8	4.2	0.0
France	48 898	4912	10.0	89.4	10.3	0.3	3755	568	15.1	88.7	10.9	0.4
Germany												
Greece	580	73	12.6	93.2	6.8	0.0	43		0.0			
Hungary	2429	239	9.8	86.2	13.0	0.8	135	19	14.1	78.9	21.1	0.0
Iceland												
Ireland	1418	114	8.0	86.8	11.4	1.8	210	31	14.8	77.4	22.6	0.0
Italy	31 268	2074	6.6	87.9	10.6	1.0						
Kazakhstan	651	27	4.1	100.0	0.0	0.0	143	6	4.2	100.0	0.0	0.0
Latvia	40						58		0.0			
Lithuania	145	9	6.2	100.0	0.0	0.0						
Macedonia	852	30	3.5	83.3	16.7	0.0	35	5	14.3	80.0	20.0	0.0
Moldova	91	13	14.3	84.6	15.4	0.0	106	27	25.5	88.9	11.1	0.0
Montenegro	102	9	8.8	88.9	11.1	0.0						
Norway	497	47	9.5	93.6	6.4	0.0	205	29	14.1	75.9	20.7	3.4
Poland	4833	607	12.6	93.9	6.1	0.0	1162	214	18.4	89.3	4.7	0.0
Portugal	1567	119	7.6	84.0	14.3	1.7	250	40	16.0	77.5	22.5	0.0
Romania	1131	2	0.2	100.0	0.0	0.0	169	2	1.2			
Russia	4405	643	14.6	92.0	7.5	0.5	1809	253	14.0	89.2	10.8	0.0
Serbia	225	16	7.1	56.3	6.3	37.5						
Slovenia	577	23	4.0	73.9	21.7	4.3	15	2	13.3	100.0	0.0	0.0
Spain	18 776	1543	8.2	85.3	14.0	0.7	4519	634	14.0	88.5	10.9	0.6
Sweden												
Switzerland												
The Netherlands												

Continued

Table IV Continued

Country	IUI-H				IUI-D							
	Cycles	Deliveries	Deliveries (%)	Singleton (%)	Twin (%)	Triplet (%)	Cycles	Deliveries	Deliveries (%)	Singleton (%)	Twin (%)	Triplet (%)
Turkey												
Ukraine	1026	178	17.3	89.3	9.6	1.1	496	83	16.7	92.8	7.2	0.0
United Kingdom	10 065						3598	433	12.0	91.5	8.1	0.5
All ^a	144 509	12 290	9.1	88.7	10.6	0.7	24 960	3 437	13.8	90.3	9.4	0.3

Poland: IUI-H, 3910 more cycles were performed without further information; IUI-D, 405 more cycles were performed without further information.

^aTotal refers to these countries where data were reported and the mean percentage was computed on countries with complete information.

of all cycles performed in those countries but in Latvia they made up 70% (238/340) of all ART cycles. The main countries of origin of the patients and the reasons for cross-border care were not sufficiently detailed to allow any meaningful conclusions to be drawn.

Discussion

The present report is the 12th, consecutive annual European report on ART data. Together the 12 reports cover treatment cycles from 1997 to 2008.

As shown in the tables, the method of reporting varies among countries and registers from a number of countries have been unable to provide some of the data. In addition, some countries may still not have implemented (adapted) the glossary published in 2006 by International Committee for Monitoring Assisted Reproductive Technologies (Zegers-Hoschild *et al.*, 2006a,b) and revised by the World Health Organization (Zegers-Hoschild *et al.*, 2009a,b) to standardize clinical definitions. It can be argued that as long as data are incomplete, generated through different methods of collection without uniformity in terms of definitions, results should be interpreted with caution. Nevertheless, the data collected reveal important trends in practice and outcomes in Europe and give a clear picture of the differences existing among countries.

In 2008, the number of countries reporting to ESHRE's European IVF-monitoring (EIM) Consortium increased to 36, covering the whole of Western Europe. Four new countries joined the Consortium (Estonia, Kazakhstan, Moldova and Romania) increasing the number of countries from Eastern Europe. Most of the independent European states that have never contributed data are very small countries (Andorra, Città del Vaticano, Liechtenstein, Luxemburg, Monaco and San Marino) but data were also not available from Slovakia, Croatia, Malta and the Republic of Belarus. Cyprus provided data in 2006 and 2007 but not in 2008. Compared with 2007, the number of clinics in each country remained relatively stable or registered an increase. The highest reported increase was in Russia (+23%).

In 2008 the coverage of all clinics was 84.5%, a figure similar to 2007(86%). The number of countries with 100% coverage increased to 19 (18 in 2007). As in previous years, the number of clinics reporting from Greece was very low (6/50 clinics), while in Spain these numbers had decreased (90/182 clinics) compared with 2007 (111/182).With Spain being the main contributor of ED and PGD/PGS in 2007, the decline of these techniques in 2008 was mainly a result of fewer clinics reporting from this country.

Overall, the number of reported cycles increased by 7.9% since 2007(+39 076), reaching a total of 532 260. Elsewhere in the world in 2008, 148 055 cycles were reported from the USA (CDC, 2010) and 61 929 cycles from Australia and New Zealand (AIHW, 2010).

After the sharp decline in the number of cycles in Germany between 2003 and 2005 (from 102 000 to 53 000) related to the reduction in the re-imburement for ART, a slow but gradual increase is evident with the number of cycles rising to 69 902 in 2008.

As shown in Table I, the average number of treatment cycles per million inhabitants was 947 but data are suggestive of huge differences in access, with the highest figures from Belgium (2687) and Denmark (2450) and the lowest from Moldova (150). A better way to define the availability of ART is to use women of reproductive age (15–45 years)

as the denominator, which eliminates the impact of age differences across the countries (Table I). Again, there were striking differences in access, ranging from 589 cycles in Moldova to 13 069 in Belgium and 12 712 in Denmark. Countries able to provide over 8000 cycles per million women of reproductive age and over 1700 cycles per million inhabitants were the Czech Republic, Estonia, Finland, Iceland, Norway and Slovenia. Overall, the highest availability was reported by Nordic countries. Finally, the percentage of newborns conceived through ART varied from 0.5% in Turkey to 4.6% in Denmark (Supplementary data, Table SI).

The proportion of ICSI versus conventional IVF procedures continues to increase (49% in 2004, 66.5% in 2006, 68% in 2007 and 69% in 2008). As recently reviewed, the trend towards increased use of ICSI has been observed throughout the world (Nyboe Andersen *et al.*, 2008; ICMART, 2009). In Australia and New Zealand, 63.2% of all cycles used ICSI in 2008 and in the USA the corresponding figure was 64.3%, reflecting a uniform trend in those three regions. However, Table I demonstrates a marked variation in the relative proportions of IVF and ICSI within Europe, with Turkey being the most frequent user of ICSI (98%) and Romania the least (17%). The difference seems to have a geographic distribution: in several countries from Northern and Eastern Europe (Denmark, Finland, Iceland, Ireland, The Netherlands, UK, Lithuania, Kazakhstan, Romania, Russia and Serbia) IVF remains the dominant technology. In contrast, in most countries from Western and Central Europe (Germany, Italy, Spain, Austria and Switzerland) ICSI was used in >75% of cases. The marked increase in the use of ICSI in the world cannot be explained by a similar increase in male infertility but rather by a more liberal use of this technique in cases with mixed infertility, unexplained infertility, mild male factor infertility and fertilization failures (Jain and Gupta, 2007; Nyboe Andersen *et al.*, 2008). This is, however, unlikely to fully account for the observed differences, which can only be explained by differences in professional strategy and clinical decision-making. In the USA, 52.9% of ICSI cycles were performed in couples without a diagnosis of male factor infertility (CDC, 2010).

Overall, in 2008, the number of transfers with three or more embryos (24.4%) was lower compared with 2007 (25.2%) but still higher than in 2006 (20.6%). The mean percentage of SETs increased from 21.4 to 22.4%, a figure similar to 2006. The proportion of DET remained stable compared with 2007 (53.2% versus 53.4%) but was lower than in 2006 (57.3%). The trend observed in previous years towards the transfer of fewer embryos seems to have reached a plateau; however, these findings may be mostly explained by the inclusion, during the last years, of data from new countries (Turkey, with a large number of treatment cycles, but also Romania, Moldova and Lithuania) where >50% of transfers were performed with three or more embryos. To have a clearer view of the overall trend over time, the countries transferring four or more embryos in >10% of the cycles decreased from 7 countries in 2007 (Bosnia, Bulgaria, Greece, Macedonia, Montenegro, Turkey and Ukraine) to only two in 2008 (Bulgaria and Lithuania). Conversely, a constant increase in the number of SETs was observed in Belgium (50.4%, +0.2%), Bosnia (52.0%, +2.4%), Finland (62.1%, +4.3%), Iceland (48.5%, +1.9%) and Slovenia (30.4%, +2.8%). A stable, high proportion of SETs was found in Sweden (69.5%), Norway (52.9%) and Denmark (39.6%). The EIM reports are unable to discriminate between the elective SET (eSET) versus the SET in general but the rise in the

number of transfers of one embryo seen in the last years is undoubtedly related to a rise in eSET. Despite fluctuations, the overall trend towards transferring fewer embryos seen over the last 10 years seems to continue. However, many differences in embryo transfer policy continue to exist across countries.

Similar observations can be made for the multiple delivery rates. In 2008, the multiple delivery rates (twins + triplets) were marginally lower compared with 2007 (21.7% versus 22.3%) but slightly higher than in 2006 (20.8%). The remarkable reduction in triplet deliveries observed from early years (3.6% in 1997 and 1.0% in 2008) persists but no real reductions are seen since 2005. As is clear from Table III, major differences in triplet and twins rates are still evident across countries. Some countries registered a triplet delivery rate >2.5% (Albania, Italy, Lithuania, Macedonia, Serbia and Turkey) while other countries were able to maintain the twin + triplets deliveries at <10% (Bosnia, Finland and Sweden).

We have included data describing preterm birth rates according to the number of fetuses of the pregnancy (Supplementary data, Table SXIV). It was completed by 17 countries. The risk of extreme preterm birth (<28 weeks) was increased 4-fold for twins and 7-fold for triplets. The risk of very preterm (28–32 weeks) birth is increased almost 6-fold for twins and 18-fold for triplets.

Fetal reductions are almost always performed in triplet or higher order gestations. Thus, when analysing the range of triplet delivery rates in different countries, the number of fetal reductions should also be considered. A total of 394 procedures were reported (30 more than in 2007). However, the number is likely to be an underestimate since several countries, including large countries such as France, Germany and Turkey, did not report on this intervention. Without fetal reductions, the proportion of triplet deliveries would have been much higher than the number of recorded triplet deliveries (782 in total).

Finally, the delivery rates per aspiration remained relatively stable for IVF (21.2%) and ICSI (20.4%) compared with figures from 2007 (21.1 and 20.2%), as did the delivery rate per thawing for FER (13.7% in 2008 versus 13.5% in 2007).

In comparison with the situation in Europe, data from other registers show that SET was performed in 63.9% of cycles in Australia and New Zealand (AIHW, 2010), and in 11.9% in the USA (CDC, 2010). The delivery rates in Europe remain lower than in the USA where in fresh non-donor cycles performed in 2008 the delivery rate per aspiration was 33.8% (34.2% in IVF and 33.6% in ICSI) and the delivery rate per transfer was 36.7% (CDC, 2010). However, the delivery rates in Europe were similar to those achieved in Australia and New Zealand, where the delivery rates in fresh cycles were 23.9% per transfer and 19.8% per aspiration (AIHW, 2010). The multiple-infant births (twins, triplets or more) were 31.6% in the USA and 8.4% in Australia and New Zealand.

Data on deliveries and babies must be considered and compared with some caution because of the difficulties met by several European countries in gathering pregnancy outcome (Supplementary data, Tables SXII and SXIII) while the pregnancy loss to follow-up was close to 0% both in the USA and Australia/New Zealand annual reports.

With the noticeable decline in the number of embryos transferred, the cumulative delivery rate per started cycle may be a most relevant endpoint for ART. However, this figure can only be obtained a few

years after the initial oocyte aspiration. In [Supplementary data, Table SXVIII](#), the cumulative delivery rate is presented as the sum of fresh and FER pregnancies obtained in the same calendar year. The method of calculation can be methodologically flawed but the estimate may be close to the actual figure. In several countries, FER deliveries added substantially to the delivery rates per cycle: Finland (19.8% to 30.5%), Belgium (17.0% to 22.6%), Sweden (21.7% to 29.4%) and Norway (23.4% to 29.5%), justifying their transfer and freezing policies.

PGD/PGS activity was recorded from 16 countries, and included 2875 cycles resulting in 411 deliveries (15.3% per aspiration). More complete data and detailed analysis of PGD/PGS in Europe will be published separately by ESHRE's PGD Consortium ([Harper et al., 2010](#)).

Regarding direct risks of ART, OHSS was recorded in 1.0% of all stimulated cycles, at the same level as in 2006 (0.8%). However, there may be a degree of under-reporting, since the rate varied between 0.02% and 2.2% in the countries reporting it.

For the seventh consecutive year the present report includes European data on treatments with IUI-H (144 509 cycles) and IUI-D (24 960 cycles), thus showing an increase in IUI-H and a decrease in IUI-D, compared with 2007. Since data on IUI have been collected, no differences over time were noted in the delivery rate and in the incidence of multiple pregnancies.

In 2008, the EIM Consortium decided to also address the phenomenon of cross-border reproductive care (CBRC). An optional module was added to the data collection sheets asking for the numbers of CBRC patients, type of treatment requested, main countries of origin and the reason for travelling abroad. A total of 2514 cycles were reported by seven countries. The number was much lower than the estimated, based on the CBRC study performed recently in Europe ([Shenfield et al., 2010](#)): 11 000 to 14 000 patients and 25 000 to 30 000 cycles per year. In addition, only incomplete information was reported regarding the countries of origin and reasons for travelling. Starting to collect new data is always difficult. However, because the CBRC phenomenon raises important public health concerns and underlines the need for a detailed evaluation, the Consortium will continue to gather more informative data in coming years.

In summary, the 12th ESHRE report on ART for Europe shows a continuing expansion in the numbers of participating clinics, countries and treatment cycles, with more than half a million cycles reported in 2008. The rise in the use of ICSI continued, reaching 69.0% in 2008. The delivery rates after IVF and ICSI remained relatively stable compared with 2007. The number of multiple transfers (3+ embryos) and the multiple delivery rate showed a marginal decline.

Supplementary data

Supplementary data are available at <http://humrep.oxfordjournals.org/>.

Authors' roles

V.G. performed the calculations. A.P.F. wrote the paper. All other co-authors reviewed the document and made appropriate corrections and suggestions for improving the document. Finally, this document represents a fully collaborative work.

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Conflict of interest

None declared.

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