International Committee for Monitoring Assisted Reproductive Technology world report: assisted reproductive technology, 2015 and 2016

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Objective: To report utilization, effectiveness, and safety of assisted reproductive technologies in 2015 and 2016.
Design: A retrospective, cross-sectional survey of 3,103 assisted reproductive technology clinics in 74 countries in 2015 and 3,249 clinics in 79 countries in 2016 that submitted cycle and pregnancy outcome data through national and regional registries.
Setting: Seventy-nine countries and >3,000 assisted reproductive technology clinics.
Patient(s): Patients undergoing assisted reproductive technology procedures.
Intervention(s): Assisted reproductive technology.
Main Outcome Measure(s): Outcomes on country, regional, and global levels.
Result(s): Reported for 2015: 2,358,239 cycles with 548,652 infants born; for 2016: 2,807,963 cycles with 647,188 infants born. Estimated in 2015, ≥2,683,677 cycles resulted in >675,134 infants; in 2016, ≥3,100,448 cycles resulted in ≥723,026 infants. Reported cycles represent approximately 80% of global utilization. In 2015 and 2016, 27.6% and 27.8%, respectively, of women undergoing fresh autologous treatment cycles were aged ≥40 years. Frozen-thawed embryo transfer (ET) cycles accounted for 47.0% and 51.9%, respectively, of all ETs in 2015 and 2016. Oocyte donation cycles accounted for 6.7% and 7.1% of all ETs in 2015 and 2016. Intracytoplasmic sperm injection was performed in 57.7% and 56.4% of autologous aspiration cycles in 2015 and 2016, respectively. The cumulative delivery rate per aspiration cycle for fresh and frozen-thawed ET was 32.4% in 2015 and 33.1% in 2016, respectively. The average number of transferred embryos was 1.70 in 2015 and 1.69 in 2016. The proportion of single ETs in fresh autologous cycles increased from 42.1% in 2015 to 44.0% in 2016. The twin delivery rate decreased from 16.0% in 2015 to

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Data sharing statement: All published data, including all tables, will be made available after publication of the manuscript. Data are also available at www.icmartivf.org.
Supplementary data are available at https://www.icmartivf.org/reports-publications/
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14.7% in 2016, and the triplet rate decreased from 0.6% in 2015 to 0.4% in 2016. The proportion of single ETs in frozen-thawed ET autologous treatment cycles was 62.2% in 2015 and 64.2% in 2016, with twin and triplet rates of 10.1% and 0.3% in 2015 and 10.0% and 0.2% in 2016, respectively.

Conclusion(s): Utilization of assisted reproductive technology treatment and births per cycle increased from 2015 to 2016, although multiple births were reduced. An increasing proportion of frozen-thawed ET cycles, continuing wide variation in use of intracytoplasmic sperm injection, and an increase in single ET rates are reported. (Fertil Steril® 2024;122:875–93. ©2024 by American Society for Reproductive Medicine.)

El resumen está disponible en Español al final del artículo.

Key Words: Assisted reproductive technology, registry, single embryo transfer, multiple births, frozen embryo transfer

This 20th world report on assisted reproductive technology (ART) is based on data collected and analyzed by the International Committee for Monitoring Assisted Reproductive Technology (ICMART), the first report from its predecessor organization, the International Working Group of Registers in Assisted Reproduction (1). The current report describes country, regional, and global estimates of ART utilization, effectiveness, and safety in 2015 and 2016. Pregnancy, neonatal outcomes, and global intrauterine insemination (IUI) data are also included.

MATERIAL AND METHODS

Data collection and analysis have been described (2, 3). In summary, data on 2015 and 2016 ART treatments were collected from regional or national ART registries or, in the case of countries for which registries do not exist, from individual clinics. In 2015, ART treatment data from China were reported for the first time. Data quality and completeness varied from country to country. The ICMART Toolbox was created as an online source to facilitate standardized ART data collection and monitoring and provides information on the number of ART clinics, procedures, and outcomes (4). These include in vitro fertilization (IVF) treatment, intracytoplasmic sperm injection (ICSI) treatment, oocyte donation, frozen-thawed embryo transfer (FET), and preimplantation genetic testing (PGT). Intrauterine insemination with both husband and partner and donor sperm is also described, despite not falling within the definition of ART treatment (5).

Although the data provided to ICMART are not independently audited, the ICMART Data Collections include inbuilt validation within and across forms so that as many potential errors and inconsistencies (e.g., totals) can be corrected at the source as possible. The University of New South Wales then runs detailed validation programs across each country's data to ensure the data are clinically and scientifically logical (e.g., relationships between total treatment cycles, aspirations, embryo transfers (ETs), pregnancies, deliveries, and infants). Finally, the ICMART Board performs clinical checks across the data and interrogates trends for anomalies. At each step, queries are sent back to regional and country representatives for clarification. Preimplantation genetic testing cycles are reported as a separate category and are not included in the report of FET or fresh ET cycles.

The ICMART data collection forms are collated by ICMART's central office and transferred to the National Perinatal Epidemiology and Statistic Unit at the University of New South Wales, Sydney, Australia, for additional data validation, analysis, and preparation of the report tables. These are verified by members of the ICMART Board. All analyses and the preparation of the report tables and figures were performed using SAS (version 9.4) and R (version 3.1.1).

Data are presented by country, region, and globally and are stratified by female age where appropriate. Trends were assessed over a 5- to 6-year period from 2010 (6). Assisted reproductive technology treatment utilization, expressed as treatment cycles per million population, is an important proxy indicator for access to infertility treatment and is calculated on the basis of the reported number of treatment cycles and the estimated number of treatment cycles to account for missing data (Appendix A). The methods for calculating ART treatment utilization were revised for the ICMART 2014 ART Report and are described in detail (2). The proportion of treatment cycles using ICSI for fertilization was only calculated for countries that reported their results according to the method of fertilization. This report follows the terminology defined in the ICMART and WHO revised Glossary of ART treatment terminology that was applicable at the time of data collection (3).

Given that country or regional ART registries obtain necessary approvals before submitting data to ICMART, institutional review board approval was not obtained for this report. Only anonymized aggregated data and no data that constituted protected health information were collected by ICMART.

RESULTS

The number of ART treatment cycles are listed in Tables 1 and 2 and ART treatment outcomes and utilization are summarized in Tables 3 and 4. Additional results are detailed in Supplemental Tables 1–30 (available online). Previous ICMART reports have been published and are available (7).

ART treatment utilization

Overall, 74 countries submitted data for the 2015 treatment year and 79 for the 2016 treatment year—a steady annual increase from the 60 countries reporting in 2010 and an increase in the number of ART treatment cycles performed over the last 2 decades (Fig. 1).

A total of 3,103 centers in 2015 and 3,249 centers in 2016 participated in the annual collection, and these centers represent 65.5% and 65.0%, respectively, of centers in these countries (Supplemental Table 1, available online). Participation varied considerably among regions, from less than a quarter

TABLE 1

Number of assisted reproductive technology cycles for the year 2015.

	Non donation cycles							
		Fresh cycles[a]			FET cycles[a]			
	Initiated cycles	Aspiration cycles			Thaw cycles	Transfer cycles	PGT cycles (initiated cycles)	Oocyte donation transfer cycles
Country name	Total	Total	IVF	ICSI	Total	Total	Total	Total
Benin	124	124	2	122	17	17	NA	11
Burkina Faso	76	76	0	76	0	0	NA	37
Cameroon	110	110	88	22	4	4	NA	86
Egypt	NA	5,612	0	5,612	2,098	1,969	NA	0
Ghana	NA	156	102	54	24	21	NA	198
Mali	132	132	2	130	8	8	NA	0
Morocco	753	743	120	623	230	230	NA	0
Nigeria	≥795	1,612	840	772	240	228	NA	983
South Africa	NA	4,466	1,376	3,090	1,669	1,620	NA	1,347
Togo	210	159	14	145	NA	33	NA	64
Tunisia	NA	2,361	92	2,269	554	522	NA	0
China	390,476	381,019	269,755	111,264	239,999	233,003	NA	NA
India[b]	≥19,331	≥18,985	NA	NA	NA	8,377	NA	0
Indonesia	NA	4,569	393	4,176	1,009	1,009	NA	NA
Japan	249,361	244,668	91,029	153,639	174,740	171,495	NA	NA
Taiwan	30,820	≥15,505	15,505	NA	9,821	9,466	675	860
Australia	39,385	35,230	12,182	23,048	23,144	22,275	5,737	1,637
New Zealand	3,428	3,159	1,212	1,947	2,249	2,197	138	243
Israel[b]	≥41,704	41,704	NA	NA	NA	NA	NA	NA
United States of America (the)	85,948	75,536	17,599	57,937	43,794	43,298	28,408	15,889
Canada	15,227	14,033	3,668	10,365	8,952	8,694	2,611	1,745
Argentina	9,991	9,181	1,358	7,823	3,638	3,573	920	2,898
Bolivia (Plurinational State of)	483	458	280	178	47	47	2	141
Brazil	17,980	16,764	1,060	15,704	8,407	8,101	4,105	1,474
Chile	2,135	1,952	118	1,834	1,101	1,027	554	558
Colombia	1,094	1,077	314	763	259	235	42	370
Dominican Republic (the)	162	159	102	57	8	8	NA	89
Ecuador	327	321	131	190	106	102	6	133
Guatemala	119	115	70	45	36	33	22	30
Mexico	5,397	5,223	1,121	4,102	1,746	1,714	382	2,217
Nicaragua	131	115	24	91	0	0	NA	24
Panama	424	373	7	366	142	110	93	87
Paraguay	87	79	38	41	24	23	9	14
Peru	1,811	1,648	681	967	622	614	1,102	1,134
Uruguay	335	297	54	243	80	79	13	72
Venezuela (Bolivarian Republic of)	827	682	261	421	193	178	41	262
Albania	112	110	0	110	50	50	0	16
Armenia	796	796	361	435	490	473	NA	178
Austria	NA	6,567	1,347	5,220	2,204	2,161	NA	7
Belarus	2,731	2,674	1,435	1,239	196	168	24	13
Belgium	NA	17,148	2,909	14,239	11,699	10,811	573	802
Bosnia and Herzegovina	≥105	≥93	93	NA	82	29	NA	0
Bulgaria	7,557	6,593	823	5,770	1,643	1,631	32	612
Cyprus	1,099	1,042	243	799	286	221	34	318
Czechia	≥13,228	≥12,872	NA	12,872	NA	10,357	1,561	4,961
Denmark	12,455	12,114	6,396	5,718	4,494	4,058	90	360
Estonia	1,864	1,864	623	1,241	911	786	NA	180
Finland	4,629	4,406	2,424	1,982	3,839	3,610	NA	831
France	NA	61,341	20,477	40,864	30,101	28,334	1,050	1,072
Germany	73,286	67,438	15,990	51,448	23,226	23,099	NA	0
Greece	16,794	16,091	2,684	13,407	4,127	3,972	680	5,182
Hungary	5,642	5,637	1,098	4,539	510	509	12	101
Iceland	NA	379	198	181	252	247	NA	108
Italy	55,329	50,214	7,107	43,107	12,903	11,849	1,941	1,615

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TABLE 1

Continued.

	Non donation cycles							
		Fresh cycles[a]			FET cycles[a]			
Country name	Initiated cycles Total	Aspiration cycles Total	IVF	ICSI	Thaw cycles Total	Transfer cycles Total	PGT cycles (initiated cycles) Total	Oocyte donation transfer cycles Total
Kazakhstan	3,617	3,617	1,734	1,883	NA	667	127	600
Latvia	1,141	1,136	372	764	452	430	62	441
Lithuania	NA	655	266	389	NA	NA	NA	0
Macedonia	1,919	1,750	372	1,378	157	147	0	58
Malta	231	216	0	216	0	0	0	0
Moldova (the Republic of)	857	807	100	707	128	96	NA	8
Montenegro	448	441	9	432	58	58	NA	0
Netherlands (the)	14,114	12,507	5,687	6,820	NA	11,327	500	0
Norway	6,456	6,456	3,316	3,140	3,868	2,814	0	0
Poland	15,432	15,201	1,010	14,191	9,458	9,227	355	1,031
Portugal	6,176	5,855	2,242	3,613	1,573	1,505	104	797
Romania	2,837	2,757	1,159	1,598	1,021	975	2	68
Russian Federation (the)	75,634	73,961	33,757	40,204	25,397	24,904	1,835	6,270
Serbia	465	440	238	202	23	23	NA	0
Slovenia	3,341	3,218	944	2,274	1,271	1,246	28	3
Spain	53,679	47,496	5,235	42,261	23,692	22,230	5,809	34,176
Sweden	12,131	11,393	5,594	5,799	NA	5,838	224	311
Switzerland	5,551	5,084	852	4,232	4,487	3,949	NA	0
Ukraine	10,887	10,654	1,626	9,028	5,868	5,789	845	1,037
United Kingdom of Great Britain and Northern Ireland (the)	44,913	42,127	18,535	23,592	15,443	14,871	555	3,321

	Non donation cycles							Donation cycles
		Fresh cycles[a]			FET cycles[a]			
Region	Initiated cycles Total	Aspiration cycles Total	IVF	ICSI	Thaw cycles Total	Transfer cycles Total	PGT cycles (initiated cycles) Total	Oocyte donation transfer cycles Total
Africa	≥2,200	15,551	2,636	12,915	4,844	4,652	NA	2,726
Asia	≥689,988	≥664,746	376,682	269,079	425,569	423,350	675	860
Australia and New Zealand	42,813	38,389	13,394	24,995	25,393	24,472	5,875	1,880
Europe	≥455,456	≥513,150	147,256	365,894	189,909	208,461	16,443	64,477
Latin America	41,303	38,444	5,619	32,825	16,409	15,844	7,291	9,503
Middle East (Israel)	≥41,704	≥41,704	NA	NA	NA	NA	NA	NA
North America	101,175	89,569	21,267	68,302	52,746	51,992	31,019	17,634
Total	≥1,374,639	≥1,401,553	566,854	774,010	714,870	728,771	61,303	97,080

Note: The total numbers and numbers by region were calculated only from the countries where data are available in the world report using the weighted mean method for rate metrics and summation for absolute values. FET = frozen-thawed embryo transfer; ICSI = intracytoplasmic sperm injection; IVF = in vitro fertilization; NA = Not available; PGT = preimplantation genetic testing.

[a] Excluding PGT and oocyte donation cycles

[b] Countries that did not separate ICSI and IVF

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of clinics reporting in Africa to complete participation in Australia, New Zealand, and Israel. In 2015 and 2016, approximately 42.6% and 41.5% of clinics, respectively, were in Europe; 35.4% were in Asia for both years. In 2016, 23.4% of centers globally performed ≥1000 cycles, led by Europe (53.1%) and Australia/New Zealand (31.8%). Smaller centers (<200 cycles) predominated in Africa in 2016 (54.9%) (Supplemental Table 16).

China first reported to ICMART for the 2015 treatment year, with 630,475 ART treatment cycles from 267 participating clinics, representing 8.6% of reporting clinics and 26.7% of ART treatment cycles worldwide. The number of ART treatment cycles increased to 908,574 in 2016 and represented 9.9% of clinics and 32.4% of global cycles (8). The impact of data from China is presented in Supplemental Figures 1 and 2 (available online), which report regional outcomes regarding the proportion of aspiration treatment cycles with ICSI, pregnancy rates per fresh and FET cycles, and FET cycles as a proportion of all ET cycles.

TABLE 2

Number of assisted reproductive technology cycles for the year 2016.

	Non donation cycles							
		Fresh cycles[a]			FET cycles[a]			
	Initiated cycles	Aspiration cycles			Thaw cycles	Transfer cycles	PGT cycles (initiated cycles)	Oocyte donation transfer cycles
Country name	Total	Total	IVF	ICSI	Total	Total	Total	Total
Benin	131	131	1	130	15	14	NA	8
Burkina Faso	82	82	0	82	0	0	NA	38
Cameroon	109	109	91	18	3	3	NA	88
Egypt	≥14	10,668	3	10,665	2,276	2,148	NA	0
Ethiopia	119	99	0	99	6	4	NA	0
Ghana	349	347	254	93	108	101	NA	423
Ivory Coast	135	113	112	1	41	41	NA	237
Mali	126	126	17	109	39	39	NA	0
Mauritius	125	125	0	125	53	50	NA	0
Morocco	710	710	39	671	NA	230	NA	NA
Nigeria	≥521	979	483	496	115	113	NA	848
South Africa	NA	4,081	1,303	2,778	1,890	1,860	NA	1,281
Togo	201	157	33	124	41	39	NA	59
Tunisia	NA	2,911	71	2,840	645	623	NA	0
China	541,428	530,718	375,770	154,948	367,146	359,921	NA	NA
India[b]	≥31,632	≥22,929	NA	NA	NA	11,527	NA	6,352
Indonesia	6,092	6,092	1,380	4,712	1,141	1,141	NA	NA
Japan	255,801	251,372	92,158	159,214	191,962	188,338	NA	NA
Taiwan	34,476	NA	NA	NA	NA	NA	1,373	903
Australia	39,926	35,426	11,376	24,050	NA	22,708	7,139	1,862
New Zealand	3,408	3,049	1,106	1,943	NA	2,375	335	246
Israel[b]	≥41,143	41,143	NA	NA	NA	NA	NA	NA
United States of America (the)	84,206	73,959	15,867	58,092	47,359	46,855	37,476	16,135
Canada	13,260	12,498	2,145	10,353	10,573	10,420	4,571	1,966
Argentina	10,703	10,279	1,433	8,846	4,431	4,351	414	3,375
Bolivia (Plurinational State of)	499	495	332	163	63	59	0	160
Brazil	19,003	18,419	453	17,966	9,127	8,946	3,308	1,624
Chile	2,195	2,053	121	1,932	1,023	1,009	412	739
Colombia	1,230	1,207	429	778	449	427	34	465
Ecuador	501	451	158	293	267	264	9	232
Guatemala	105	105	47	58	41	40	17	35
Mexico	5,780	5,722	1,322	4,400	2,453	2,431	498	2,633
Nicaragua	109	98	17	81	7	7	0	14
Panama	422	374	3	371	143	136	86	101
Paraguay	106	101	44	57	49	48	19	27
Peru	1,390	1,386	546	840	563	563	562	676
Dominican Republic (the)	39	38	10	28	18	18	0	43
Uruguay	573	573	285	288	218	215	3	106
Venezuela (Bolivarian Republic of)	615	547	180	367	170	165	9	246
Albania	83	83	0	83	63	63	0	29
Armenia	178	178	66	112	107	105	0	61
Austria	≥10,097	7,059	1,459	5,600	2,662	2,627	0	0
Belarus	2,704	2,569	1,241	1,328	270	246	7	16
Belgium	≥19,163	16,343	2,715	13,628	12,052	11,223	1,100	1,163
Bosnia and Herzegovina[b]	≥89	≥80	NA	80	46	46	0	0
Bulgaria	7,799	6,528	868	5,660	1,813	1,750	379	1,018
Cyprus	1,100	959	146	813	325	229	31	271
Czechia[b]	≥15,020	≥14,661	NA	14,661	12,258	11,719	0	5,265
Denmark	12,022	12,010	6,309	5,701	5,059	4,632	112	484
Estonia	1,825	1,819	635	1,184	927	819	2	191
Finland	4,726	4,452	2,573	1,879	NA	3,661	73	731
France	67,987	61,645	20,058	41,587	33,792	32,164	1,422	1,158
Germany	74,181	68,469	16,234	52,235	25,045	24,607	0	0
Greece	17,425	15,338	2,256	13,082	4,785	4,611	1,251	4,462
Hungary	4,951	4,914	1,043	3,871	NA	632	0	25
Iceland	NA	361	199	162	229	228	0	54
Ireland	446	397	183	214	260	256	0	0

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TABLE 2

Continued.

	Non donation cycles							
		Fresh cycles[a]			FET cycles[a]			
Country name	Initiated cycles Total	Aspiration cycles Total	IVF	ICSI	Thaw cycles Total	Transfer cycles Total	PGT cycles (initiated cycles) Total	Oocyte donation transfer cycles Total
Italy	53,906	48,756	6,857	41,899	14,990	14,328	2,844	4,359
Kazakhstan	2,665	2,622	974	1,648	NA	958	154	683
Latvia	879	879	352	527	515	501	7	127
Lithuania	NA	666	295	371	92	90	0	0
Luxembourg	666	615	296	319	314	291	0	0
Macedonia	2,520	2,458	390	2,068	288	287	0	122
Malta	≥273	194	7	187	0	0	0	0
Moldova (the Republic of)	739	731	0	731	181	181	0	14
Montenegro	508	503	7	496	58	58	0	0
Netherlands (the)	14,584	12,857	5,819	7,038	NA	12,545	772	0
Norway	6,917	6,584	3,412	3,172	3,363	2,948	0	0
Poland	17,865	17,808	873	16,935	11,375	11,305	692	1,085
Portugal	6,213	5,955	2,279	3,676	2,008	1,912	127	988
Romania	3,479	3,353	1,399	1,954	1,495	1,463	6	29
Russian Federation (the)	77,824	75,671	33,129	42,542	31,051	30,389	4,420	7,122
Serbia	263	253	166	87	23	20	0	0
Slovenia	3,285	3,136	916	2,220	1,389	1,357	37	7
Spain	62,264	50,602	5,229	45,373	27,559	26,186	10,238	39,530
Sweden	12,323	11,547	5,803	5,744	NA	6,080	304	282
Switzerland	6,101	5,579	958	4,621	4,859	4,262	0	0
Ukraine	10,621	10,384	1,141	9,243	6,967	6,875	1,658	1,157
United Kingdom of Great Britain and Northern Ireland (the)	44,357	41,580	18,483	23,097	18,311	17,792	1,433	3,494

	Non donation cycles							Donation cycles
		Fresh cycles[a]			FET cycles[a]			
Region	Initiated cycles Total	Aspiration cycles Total	IVF	ICSI	Thaw cycles Total	Transfer cycles Total	PGT cycles (initiated cycles) Total	Oocyte donation transfer cycles Total
Africa	≥2,622	20,638	2,407	18,231	5,232	5,265	NA	≥2,982
Asia	≥869,429	≥811,111	469,308	318,874	560,249	560,927	1,373	≥7,255
Australia and New Zealand	43,334	38,475	12,482	25,993	NA	25,083	7,474	2,108
Europe	≥568,048	≥520,598	144,770	375,828	224,531	239,446	27,069	≥73,927
Latin America	43,270	41,848	5,380	36,468	19,022	18,679	5,371	10,476
Middle East (Israel)	≥41,143	≥41,143	NA	NA	NA	NA	NA	NA
North America	97,466	86,457	18,012	68,445	57,932	57,275	42,047	18,101
Total	≥1,665,312	≥1,560,270	652,359	843,839	866,966	906,675	83,334	≥114,849

Note: The total numbers and numbers by region were calculated only from the countries where data are available in the world report using weighted mean method for rate metrics and summation for absolute values. FET = frozen-thawed embryo transfer; ICSI = intracytoplasmic sperm injection; IVF = in vitro fertilization; NA = Not available; PGT = preimplantation genetic testing.

[a] Excluding PGT and oocyte donation cycles

[b] Countries that did not separate ICSI and IVF

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Worldwide, participating centers reported a total of 2,358,239 ART treatment cycles in 2015 and 2,807,963 in 2016. These were calculated as the sum of reported initiated fresh autologous cycles, frozen and thawed autologous treatment cycles, initiated PGT treatment cycles, and fresh, frozen and thawed oocyte donation transfer cycles. After accounting for missing values and nonreporting centers from participating countries, the estimated number of ART treatment cycles performed in 2015 was 2,683,677 and in 2016 was 3,100,448 (Table 4).

The countries performing the greatest number of estimated number of ART treatment cycles were China and Japan (Tables 1 and 3). Assisted reproductive technology utilization globally was 512 treatment cycles per million population in

TABLE 3

Summary of assisted reproductive technology outcomes and assisted reproductive technology utilization for the year 2015.

	Autologous Fresh IVF and ICSI (excl PGT)						Autologous FET	Autologous and heterologous Fresh + FET plus PGT						
Country name	Aspirations excluding freeze-all embryos	PR/asp (%)[a]	DR/asp (%)	Cumul. DR/total aspirations (%)	Infants/asp fresh (%)[b]	Cumul. infants/total aspirations (%)[b]	Infants/FET (%)[b]	Reported overall total number of cycles[c]	Estimated or reported overall total number of cycles[a]	Utilization cycles/million[d]	Total infants reported from participating clinics[e]	Total infants estimated from all clinics	Confidence in estimation[f]	
Benin[g]	116	33.6	26.7	25.8	19.8	20.7	5.9	152	≥152	15	24	≥28	h	
Burkina Faso[g]	76	36.8	18.4	18.4	25.0	NAp	NAp	113	≥113	6	19	≥36	h	
Cameroon	110	34.5	32.7	32.7	44.5	NAp	NAp	200	≥400	17	49	≥192	i	
Egypt	5,602	33.5	NA	NA	NA	NA	NA	8,040[j]	≥8,040	91	2,208	≥2,208	k	
Ghana	149	32.2	27.5	27.6	36.2	36.9	5.6	387[j]	≥968	37	55	≥425	i	
Mali[g]	129	42.6	23.3	23.5	29.5	30.2	12.5	140	≥140	8	39	≥39	h	
Morocco	723	38.0	16.0	19.0	n.p.	NAp	NA	983	≥983	29	10	≥10	k	
Nigeria	1,496	33.8	26.5	25.8	45.7	49.5	24.6	2,907[j]	≥2,907	16	740	≥1,146	k	
South Africa	3,677	27.9	9.8	10.6	26.1	38.5	28.1	7,745[j]	≥9,681	180	1,417	≥2,482	l	
Togo	145	18.6	11.7	11.3	13.8	14.5	3.0	308[j]	≥616	82	21	≥60	i	
Tunisia	2,328	34.6	26.7	31.6	33.4	39.8	28.7	3,053[j]	≥3,053	277	927	≥927	k	
China[g]	192,249	50.8	40.9	44.7	NAp	NAp	NA	630,475	≥649,366	475	216,041	222,514	h	
India	≥18,985	NAp	NAp	NA	44.1	67.7	53.3	19,331	≥160,000	128	12,844	≥16,432	m	
Indonesia	4,147	36.0	NAp	NAp	NAp	..	NAp	5,847[j]	≥6,522	25	NA	≥2,353	l	
Japan[g]	150,510	9.7	6.7	20.4	7.0	34.2	23.9	424,101	≥445,528	3,510	51,450	≥54,049	h	
Taiwan[g]	≥15,505	59.0	NAp	NA	NAp	NAp	NA	42,176	42,176	1,801	NA	≥10,483	h	
Australia[g]	30,655	22.8	18.0	32.1	19.1	39.2	27.6	69,903	≥69,903	3,073	13,408	≥13,408	h	
New Zealand[g]	2,671	32.2	25.7	40.7	26.9	50.5	28.7	6,058	≥6,058	1,365	1,460	≥1,460	h	
Israel[g]	≥41,704	NAp	NAp	NA	NAp	NAp	NA	41,704	≥41,704	5,181	NA	NA	h	
United States of America (the)	62,616	38.0	30.7	49.4	38.0	72.6	50.0	174,039	214,851	669	68,960	85,131	l	
Canada	11,721	32.8	25.0	38.0	29.7	54.0	32.7	28,535	30,264	862	7,393	7,841	l	
Argentina[g]	7,662	23.7	17.7	23.3	21.1	32.9	25.3	17,447	≥19,567	451	3,621	≥6,493	m	
Bolivia (Plurinational State of)[g]	451	37.7	32.6	35.6	38.1	41.9	36.2	673	≥881	82	260	≥607	m	
Brazil[g]	11,951	28.5	19.9	27.6	24.0	46.8	33.7	31,966	≥34,962	171	6,384	≥7,044	m	
Chile[g]	1,426	31.6	26.9	35.9	31.1	57.4	36.6	4,348	≥4,916	281	1,153	≥1,268	m	
Colombia[g]	983	38.8	30.4	36.3	37.4	49.0	48.5	1,765	≥2,953	63	689	≥1,190	m	
Dominican Republic (the)[g]	159	36.5	27.7	30.2	34.6	37.7	62.5	259	≥259	25	119	≥119	h	
Ecuador[g]	265	35.5	29.1	34.3	38.5	55.8	45.1	572	≥679	43	233	≥280	m	
Guatemala[g]	104	34.6	30.8	39.1	39.4	55.8	51.5	207	≥275	18	87	≥87	m	
Mexico[g]	4,322	35.5	28.6	34.1	36.3	51.8	39.0	9,742	≥12,774	105	3,594	≥5,913	m	
Nicaragua[g]	115	42.6	40.9	40.9	45.2	NAp	NA	155	≥172	29	64	≥64	m	
Panama[g]	272	40.4	37.9	39.1	42.3	60.3	44.5	746	≥947	259	241	≥241	m	
Paraguay[g]	52	46.2	30.8	27.8	40.4	53.8	30.4	134	≥200	29	29	≥58	m	
Peru[g]	1,116	20.0	16.4	25.4	18.7	43.4	44.8	4,669	≥5,568	183	1,153	≥1,153	m	
Uruguay[g]	272	27.2	22.4	28.6	26.5	36.4	34.2	500	≥561	168	137	≥137	m	
Venezuela (Bolivarian Republic of)[g]	609	34.3	25.8	30.1	29.6	38.6	30.9	1,323	≥1,519	52	354	≥354	m	
Albania	105	42.9	34.3	44.5	43.8	59.0	32.0	178	≥178	59	62	≥67	k	
Armenia	648	47.8	38.4	50.9	54.3	85.2	42.3	1,464	≥1,830	599	552	≥764	l	
Austria[g]	6,567	31.4	26.9	36.7	NAp	NAp	NAp	9,164[j]	≥9,164	1,058	NA	≥5	h	
Belarus	2,639	39.7	31.8	32.6	44.6	47.5	45.2	2,964	≥3,952	412	1,254	≥1,691	l	
Belgium[g]	15,677	23.2	19.0	29.1	22.7	37.8	21.9	31,230[j]	≥31,230	2,758	6,061	≥6,256	h	

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TABLE 3

Continued.

	Autologous Fresh IVF and ICSI (excl PGT)						Autologous FET	Autologous and heterologous Fresh + FET plus PGT					
Country name	Aspirations excluding freeze-all embryos	PR/asp (%)[a]	DR/asp (%)	Cumul. DR/total aspirations (%)	Infants/asp fresh (%)[b]	Cumul. infants/ total aspirations (%)[b]	Infants/FET (%)[b]	Reported overall total number of cycles[c]	Estimated or reported overall total number of cycles[a]	Utilization cycles/ million[d]	Total infants reported from participating clinics[e]	Total infants estimated from all clinics	Confidence in estimation[f]
Bosnia and Herzegovina	≥47	NAp	NAp	NA	NAp	NAp	31.7	285[j]	≥855	221	202	≥606	[i]
Bulgaria[g]	6,090	29.1	20.8	24.4	NAp	NAp	NAp	9,844	≥9,844	1,370	7	≥2,150	[h]
Cyprus[g]	826	49.3	46.0	41.7	NAp	NAp	NA	1,737	≥1,737	1,461	NA	≥242	[h]
Czechia[g]	≥12,840	NAp	NAp	NA	24.2	44.4	25.0	19,750	≥20,232	1,901	5,751	≥7,346	[h]
Denmark[g]	11,732	24.2	21.3	28.5	23.1	31.9	25.4	17,399	≥17,399	3,117	3,768	≥3,876	[h]
Estonia[g]	1,789	28.6	20.6	26.1	23.6	31.5	17.9	2,955	≥2,955	2,335	563	≥636	[h]
Finland[g]	4,406	26.5	20.5	37.9	NAp	NAp	NAp	9,299	≥9,299	1,698	NA	≥2,146	[h]
France[g]	57,133	25.0	20.4	27.1	NAp	NAp	NAp	97,171[j]	≥97,171	1,460	231	≥19,768	[h]
Germany[g]	67,438	26.8	19.6	25.5	25.8	33.2	21.7	96,512	≥99,482	1,230	22,403	≥23,092	[h]
Greece[g]	14,556	29.4	18.8	22.2	29.7	38.5	32.4	26,783	≥26,783	2,486	5,700	≥7,717	[h]
Hungary	5,517	23.7	NAp	NAp	NAp	NAp	NAp	6,265	≥7,404	748	NA	NA	[l]
Iceland[g]	204	47.1	34.8	30.3	37.7	61.8	19.8	762[j]	≥7,62	2,296	126	≥154	[h]
Italy[g]	50,214	20.1	12.9	17.7	18.5	24.1	23.8	71,788	≥71,788	1,161	12,656	≥13,037	[h]
Kazakhstan	3,617	39.8	28.6	33.3	34.2	NAp	NA	4,344	≥4,344	239	1,238	≥1,712	[k]
Latvia	836	40.7	29.8	36.0	27.9	45.1	33.5	2,096	≥2,620	1,319	395	≥739	[l]
Lithuania	655	33.6	NAp	NAp	NAp	NAp	NA	694[j]	2,082	722	NA	NA	[i]
Macedonia	1,637	43.4	31.2	30.5	45.0	47.8	32.0	2,134	≥3,735	1,782	783	≥1,418	[i]
Malta[g]	216	NAp	NAp	NAp	31.0	NAp	NAp	231	≥231	558	67	≥67	[h]
Moldova (the Republic of)	717	48.7	44.6	44.0	NAp	NAp	NA	993	≥1,324	373	NA	≥7	[l]
Montenegro	441	25.4	17.7	21.8	NAp	NAp	NAp	506	≥632	977	NA	≥139	[l]
Netherlands (the)[g]	12,507	31.5	23.4	36.8	NAp	NAp	NA	14,614	≥14,614	862	NA	≥138	[h]
Norway[g]	6,456	27.4	22.9	32.2	NAp	NAp	NA	10,324	≥10,324	1,982	NA	NA	[h]
Poland	12,694	33.3	22.2	30.9	31.4	52.0	28.3	26,276	≥310,53	805	6,632	≥8,220	[l]
Portugal[g]	5,347	30.2	22.7	26.5	28.2	35.9	27.4	8,650	≥8,650	799	1,930	≥2,317	[h]
Romania	2,602	37.0	29.9	34.9	39.8	NAp	NAp	3,928	≥5,892	272	1,035	≥1,899	[l]
Russian Federation (the)	65,495	33.3	24.2	31.0	30.8	43.4	33.1	109,136	≥142,483	1,000	28,933	≥41,147	[l]
Serbia	440	32.7	25.2	27.0	NAp	NAp	NA	488	≥488	68	NA	≥131	[k]
Slovenia[g]	3,047	30.5	23.9	32.6	26.5	39.0	30.5	4,643	≥4,643	2,341	1,191	≥1,191	[h]
Spain	39,143	30.8	21.7	28.9	28.6	45.8	30.3	117,356	≥127,009	2,638	19,157	≥35,276	[l]
Sweden[g]	11,393	28.7	24.1	39.1	25.2	40.6	30.1	12,666	≥12,666	1,292	4,689	≥4,805	[h]
Switzerland[g]	5,084	23.9	18.3	30.9	21.6	36.2	18.7	10,038	≥10,410	1,282	1,840	≥1,908	[h]
Ukraine	9,025	37.6	29.1	45.3	37.4	67.2	46.4	18,637	≥44,522	1,002	6,429	≥16,954	[i]
United Kingdom of Great Britain and Northern Ireland (the)[g]	42,127	33.2	29.0	39.5	33.6	46.1	35.2	64,232	≥64,232	1,002	19,814	≥21,281	[h]

	Autologous Fresh IVF and ICSI (excl PGT)						Autologous FET	Autologous and heterologous Fresh + FET plus PGT				
Region	Aspirations excluding freeze-all embryos	PR/Asp (%)[a]	DR/Asp (%)	Cumul. DR/Total Aspirations (%)	Infants/Asp Fresh (%)[b]	Cumul. Infants/ Total Aspirations (%)[b]	Infants/FET (%)[b]	Reported overall total number of cycles[c]	Estimated or reported overall total number of cycles[a]	Availability Cycles/ million[d]	Total infants reported from participating clinics[e]	Total infants estimated from all clinics
Africa	14,551	32.5	18,6	20.3	31.9	40.1	27.2	24,028	≥27,053	53	5,509	≥7,553
Asia	≥381,396	33.9	25.9	34.0	11.2	38.0	25.3	1,121,930	≥1,303,592	431	280,335	≥305,831
Australia and New Zealand[g]	33,326	23.6	18.6	32.8	19.7	40.1	27.7	75,961	≥75,961	2,794	14,868	≥14,868

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TABLE 3

Continued.

	Autologous Fresh IVF and ICSI (excl PGT)						Autologous FET	Autologous and heterologous Fresh + FET plus PGT				
Region	Aspirations excluding freeze-all embryos	PR/Asp (%)[a]	DR/Asp (%)	Cumul. DR/Total Aspirations (%)	Infants/Asp Fresh (%)[b]	Cumul. Infants/ Total Aspirations (%)[b]	Infants/FET (%)[b]	Reported overall total number of cycles[c]	Estimated or reported overall total number of cycles[a]	Availability Cycles/ million[d]	Total infants reported from participating clinics[e]	Total infants estimated from all clinics
Europe	≥481,907	28.7	21.7	29.2	27.6	39.4	28.6	817,536	≥904,019	1,198	153,469	≥228,902
Latin America[g]	29,759	29.0	21.9	28.5	26.5	44.3	33.4	74,506	≥86,233	153	18,118	≥25,008
Middle East (Israel)[g]	≥41,704	NAp	NAp	NA	NAp	NAp	NA	41,704	≥41,704	5,181	NA	NA
North America	74,337	37.2	29.8	47.6	36.7	69.7	47.1	202,574	245,115	688	76,353	92,972
Total	≥1,056,980	31.1	23.7	32.4	24.2	42.6	29.6	2,358,239	≥2,683,677	512	548,652	≥675,134

Note: Cumulative rate per aspiration, computed by adding the FET deliveries and infants to those obtained after fresh cycle, the sum being divided by the number of aspirations. Freeze-all cycles excluded from fresh autologous cycles. The total numbers and numbers by region were calculated only from the countries where data are available in the world report using weighted mean method for rate metrics and summation for absolute values. DR = delivery rate; ICMART = International Committee for Monitoring Assisted Reproductive Technologies; NA = not available; NAp = not applicable; PR = pregnancy rate.

[a] Initiated cycles overall countries estimation. Step 1: Reported cycles for countries reporting them, or estimation by applying their cancellation rate to the aspiration numbers for the countries not reporting them. Step 2: Total of step 1 if either 100% of the cycles/centers reported or the cycle reporting/center participation rate is <33%; otherwise, estimation by applying the percentage of reported cycles/participating centers to this total. Step3: Where the ICMART Regional Representative provides an informed estimate for the overall total number of cycles performed in a country, the metric derived in Step 2 will be replaced with the informed estimate. The confidence in the estimation is highlighted in the last column of the table.

[b] Scenario 1: The number of total deliveries, singleton deliveries, twin deliveries and triplet+ deliveries are available and lost to follow-up deliveries is zero. The number of infants is calculated from the country-specific number of singletons, twins and triplet+ deliveries. Scenario 2: The number of total deliveries, singleton deliveries, twin deliveries and triplet + deliveries are available and lost to follow-up deliveries more than zero. The number of singletons, twins, triplets+ is calculated using the country-specific number of singletons, twins and triplets+ deliveries. In addition, an estimate of singleton, twin and triplet deliveries that were lost to follow-up is made based on the country-specific distribution of reported singletons, twins and triplets+. The metrics reported in Columns 6-8 are based on the sum of reported singletons, twins, triplets+ plus the estimated number of lost-to-follow-up infants. Scenario 3: Where a country does not report singleton, twin, and/or triplet+ deliveries, the metrics in Columns 6-8 will be reported as "NAp"; or as "NA" if both nominator (infants) and denominator "aspirations" are "blank."

[c] The reported overall total number of cycles is a summation of fresh IVF initiated cycles, fresh ICSI initiated cycles, thaw cycles in form 2a in the data collection form (DCF); initiated preimplantation genetic diagnosis (PGD; now PGT-M) cycles in form 7a and initiated PGS (now PGT-A and PGT-SR) cycles in form 7b in the DCF; fresh oocyte donation (OD) transfer in form 8b and FET OD transfer in form 8c in the DCF.

[d] Total estimated or reported number of cycles in the country (Column 10) divided by its population in 2015 (CIA World Fact Book)

[e] Total infants reported from participating clinics is a summation of the reported number of infants after fresh and frozen embryo transfer, PGD, PGS, and fresh and FET OD cycles.

[f] Confidence in estimated or reported overall total number of cycles.

[g] Estimated or reported overall total number of cycles calculated based on rate of reporting based on cycles, not centers.

[h] ≥95% of cycles/centers reported (certain confidence)

[i] Modest confidence estimate (33-65% of cycles/centers reported)

[j] The reported overall total number of cycles is a summation of initiated IVF + initiated ICSI + Thaw cycles + PGD initiated + PGS initiated + OD fresh ET + OD FET. Where initiated cycles/thaw cycles were not reported, these were imputed from aspirations and FET by applying weighted average cancellation rate of all the countries reporting both.

[k] Total number of cycles and infants based on reported number of cycles and infants because the rate of reporting based on centers is <33% and an informed estimate of the total number of cycles was not available.

[l] High confidence estimate (66-94% of cycles/centers reported)

[m] Informed estimate of the total number of cycles obtained from ICMART regional representative.

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TABLE 4

Summary of assisted reproductive technology outcomes and assisted reproductive technology utilization for the year 2016.

	Autologous Fresh IVF and ICSI (excl PGT)						Autologous FET	Autologous and heterologous Fresh + FET plus PGT					
Country name	Aspirations excluding freeze-all embryos	PR/asp (%)[a]	DR/asp (%)	Cumul. DR/total aspirations (%)	Infants/Asp Fresh (%)[b]	Cumul. infants/ total Aspirations (%)[b]	Infants/FET (%)[b]	Reported overall total number of cycles[c]	Estimated or reported overall total number of cycles[a]	Availability Cycles/million[d]	Total infants reported from participating clinics[e]	Total infants estimated from all clinics	Confidence in estimation[f]
Benin[g]	122	37.7	29.5	NAp	26.2	NAp	NAp	154	≥154	14	32	≥33	h
Burkina Faso[g]	82	37.8	28,0	28,0	36.6	36.6	NA	120	≥120	6	30	≥39	h
Cameroon	109	45.9	43.1	43.1	47.7	NAp	NAp	200	≥400	16	52	≥180	i
Egypt[g]	10,302	36.9	NA	NA	NA	NA	NA	13,495[j]	≥13,495	143	3,018	≥3,018	k
Ethiopia[g]	93	28,3	8,1	9,1	14.0	15.1	16.7	125	≥125	1	14	≥14	h
Ghana	333	39.6	28.2	32.0	34.5	41.4	23.5	880	≥1,613	60	138	≥629	i
Ivory Coast[g]	63	54.0	27.0	24.8	22.2	36.5	18.8	413	≥413	17	23	≥61	h
Mali[g]	125	48.8	46.4	53.2	65.6	74.4	28.2	165	≥165	9	93	≥93	h
Mauritius[g]	122	32.8	NAp	NAp	NAp	NAp	NA	178	≥178	132	NA	NA	k
Morocco	684	38.7	20.3	23.1	NAp	NAp	NA	710	≥710	21	NA	NA	k
Nigeria[g]	920	31.7	28.0	28.4	57.4	62.8	40.3	1,991[j]	≥1,991	11	578	≥925	k
South Africa	2,715	32.9	14.1	14.4	26.8	NAp	NA	7,459[j]	≥13,053	240	728	≥2,140	i
Togo	144	10.4	8.3	10.8	10.4	15.3	17.9	301	≥602	78	22	≥84	i
Tunisia	2,847	34.8	27.6	32.2	34.4	41.0	30.3	3,704[j]	≥3,704	333	1,168	≥1,168	k
China[g]	241,744	49.2	39.8	44.1	NAp	NAp	NA	908,574	≥919,826	670	264,639	267,916	h
India[g]	≥22,929	NAp	NAp	NA	31.4	65.0	66.7	37,984	≥175,000	138	14,899	≥19,456	m
Indonesia	5,366	31.7	NAp	NAp	NAp	NAp	NAp	7,233	≥7,750	30	NA	NA	l
Japan[g]	146,797	9.0	6.3	21.0	6.5	37.1	23.9	447,763	≥459,968	3,630	54,485	≥55,970	h
Taiwan	NA	NAp	NA	NA	NAp	NA	NA	49,378[j]	≥49,378	2,104	8,993	≥9,466	h
Australia	29,326	21.4	17.0	31.3	17.8	39.5	28.0	72,007[j]	≥72,007	3,132	13,585	≥13,585	h
New Zealand	2,525	33.0	26.7	47.0	27.4	58.2	32.7	5,438[j]	≥5,438	1,215	1,599	≥1,599	h
Israel[g]	≥41,143	NAp	NAp	NA	NAp	NAp	NA	41,143	≥41,143	5,033	NA	NA	h
United States of America (the)	57,483	35.6	28.5	48.7	34.3	74.4	49.3	185,176	224,962	694	69,529	84,468	l
Canada[g]	9,455	31.0	23.9	41.7	27.3	63.3	32.7	30,370	30,370	859	7,372	7,372	h
Argentina	8,282	22.3	15.7	20.4	19.6	32.4	24.2	18,923	≥23,288	531	3,708	7,141	m
Bolivia (Plurinational State of)	485	28.0	21.9	26.1	26.2	32.4	50.8	722	≥840	77	222	518	m
Brazil	11,468	26.7	19.6	24.5	25.7	52.8	34.7	33,062	≥38,792	188	7,003	7,229	m
Chile	1,307	32.4	23.4	29.9	30.3	60.1	38.7	4,369	≥5,360	304	1,264	1,390	m
Colombia	997	34.2	27.7	32.3	32.8	47.0	33.3	2,178	≥3,732	79	707	1,119	m
Ecuador	334	40.7	32.0	41.5	39.2	71.3	40.5	1,009	≥1,408	88	354	354	m
Guatemala	84	26.2	23.8	32.4	33.3	53.6	42.5	198	≥286	19	73	73	m
Mexico	4,288	33.1	27.4	33.6	33.9	55.6	38.4	11,364	≥15,228	124	3,819	5,902	m
Nicaragua	98	43.9	39.8	45.9	50.0	58.2	NAp	130	≥144	24	65	65	m
Panama	242	39.3	33.1	35.0	42.6	66.9	43.4	752	≥998	269	236	236	m
Paraguay	64	25.0	25.0	22.8	28.1	39.1	14.6	201	≥342	50	31	62	m
Peru	669	25.7	14.3	14.9	23.0	65.9	51.0	3,191	≥4,937	161	658	658	m
Dominican Republic (the)[g]	35	48.6	42.9	52.6	48.6	62.9	27.8	100	≥100	9	38	38	h
Uruguay	467	25.7	20.3	29.8	25.9	46.0	43.7	900	≥1,136	339	256	512	m
Venezuela (Bolivarian Republic of)	491	30.8	23.8	28.7	28.9	39.5	31.5	1,040	≥1,253	41	310	310	m
Albania[g]	74	45.9	37.8	51.8	55.4	82.4	31.7	175	≥175	58	73	≥73	k
Armenia	114	39.5	33.3	38.2	43.0	75.4	35.2	346	≥865	283	125	≥312	i
Austria[g]	7,059	29.6	NAp	NAp	41.6	NAp	NA	18,643[j]	≥18,643	2,140	2,937	≥2,937	h
Belarus	2,396	37.8	27.9	27.6	37.5	40.3	27.6	2,997	≥3,425	358	977	≥1,117	l

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TABLE 4

Continued.

Country name	Autologous Fresh IVF and ICSI (excl PGT)						Autologous FET	Autologous and heterologous Fresh + FET plus PGT					
	Aspirations excluding freeze-all embryos	PR/asp (%)[a]	DR/asp (%)	Cumul. DR/total aspirations (%)	Infants/Asp Fresh (%)[b]	Cumul. infants/ total Aspirations (%)[b]	Infants/FET (%)[b]	Reported overall total number of cycles[c]	Estimated or reported overall total number of cycles[a]	Availability Cycles/million[d]	Total infants reported from participating clinics[e]	Total infants estimated from all clinics	Confidence in estimation[f]
Belgium[g]	14,594	27.8	18.7	29.3	23.4	41.9	24.0	47,796[j]	≥47,796	4,189	6,494	≥6,494	h
Bosnia and Herzegovina[g]	≥80	NAp	NAp	NA	30.0	38.8	15.2	135	≥135	35	31	≥31	k
Bulgaria[g]	5,785	29.0	21.3	25.8	NAp	NAp	NA	11,009	≥11,009	1,541	376	≥376	h
Cyprus[g]	830	45.2	42.5	48.2	NAp	NAp	NA	1,727	≥1,727	1,433	205	≥205	h
Czechia[g]	≥14,631	NAp	NAp	NA	19.7	41.5	27.2	32,543	≥33,357	3,134	7,476	≥7,663	h
Denmark[g]	11,372	22.9	16.7	24.2	24.0	35.5	28.2	17,677	≥17,677	3,160	4,166	≥4,166	h
Estonia[g]	1,741	28.3	21.3	28.3	24.4	34.2	20.8	2,945	≥2,945	2,340	662	≥662	h
Finland[g]	4,452	23.8	18.3	36.5	NAp	NAp	NAp	5,530	≥5,530	1,006	236	≥2,060	h
France[g]	55,886	23.5	20.6	28.7	NAp	NAp	NAp	104,359	≥104,359	1,561	480	≥20,710	h
Germany[g]	68,469	27.4	18.5	24.9	26.2	34.8	24.1	99,226	≥103,877	1,287	23,846	≥24,964	h
Greece[g]	11,876	30.4	20.3	23.2	27.7	41.6	35.8	27,923	≥27,923	2,592	6,855	≥6,855	h
Hungary	4,843	32.6	NAp	NAp	NAp	NAp	NAp	4,976	≥5,881	596	NA	NA	l
Iceland	327	30.6	26.6	36.8	26.9	41.6	21.1	662[j]	≥662	1,971	156	≥156	h
Ireland[g]	397	39.5	32.0	51.6	33.5	53.7	NAp	706	≥706	143	213	≥213	k
Italy[g]	48,756	19.1	12.7	18.6	17.3	24.3	23.8	76,099	≥76,099	1,227	13,563	≥13,563	h
Kazakhstan	2,622	39.0	26.1	36.2	NAp	NAp	NA	3,502	≥7,004	381	238	≥2,940	i
Latvia	695	39.6	22.7	34.6	30.4	52.9	31.3	1,528	≥3,056	1,555	400	≥800	i
Lithuania	666	47.1	4.1	NAp	64.1	NAp	NAp	792[j]	≥950	333	427	≥512	l
Luxembourg[g]	542	18.8	15.3	22.3	17.7	28.6	20.3	980	≥980	1,683	155	≥155	h
Macedonia	2,435	35.6	17.7	20.1	33.5	37.4	33.4	2,930	≥4,102	1,953	964	≥1,350	l
Malta[g]	193	NAp	NAp	NAp	NAp	NAp	NAp	280[j]	≥280	674	NA	≥39	h
Moldova (the Republic of)	731	41.9	34.7	46.0	NAp	NAp	NA	934	≥1,245	355	7	≥9	l
Montenegro	484	28.5	22.3	24.7	NAp	NAp	NAp	566	≥708	1,098	NA	≥182	l
Netherlands (the)[g]	12,857	32.1	23.5	38.7	NAp	NAp	NA	15,356	≥15,356	902	NA	NA	h
Norway[g]	6,584	29.2	24.5	34.0	NAp	NAp	NA	10,280	≥10,280	1,952	NA	NA	h
Poland[g]	14,384	32.2	19.8	31.1	28.5	52.6	30.7	31,017	≥31,017	805	8,008	≥8,008	h
Portugal[g]	5,056	30.0	22.8	27.1	27.8	38.2	27.6	9,336	≥9,336	862	2,358	≥2,358	h
Romania	3,015	33.0	25.6	31.8	34.1	48.9	30.5	5,009	≥8,652	401	1,477	≥2,551	i
Russian Federation (the)	62,788	33.3	24.0	31.2	29.4	45.8	33.9	120,417	≥158,695	1,115	32,246	≥42,496	l
Serbia[g]	247	32.0	27.9	30.8	36.8	40.5	45.0	286	≥286	40	100	≥100	k
Slovenia[g]	3,020	28.9	23.0	32.3	25.3	36.9	25.8	4,718	≥4,718	2,385	1,122	≥1,122	h
Spain[g]	41,195	28.0	20.3	29.0	24.5	43.7	30.2	139,591	≥143,662	2,958	34,249	≥35,248	h
Sweden	11,547	28.4	23.8	40.3	24.5	41.5	32.2	12,909	≥13,668	1,383	4,932	≥5,222	l
Switzerland[g]	5,379	25.4	19.6	33.4	23.0	40.6	22.2	10,960	≥10,960	1,340	2,184	≥2,184	h
Ukraine	6,979	45.9	36.8	50.7	47.8	96.2	49.2	20,403	≥24,698	559	7,891	≥9,552	l
United Kingdom of Great Britain and Northern Ireland (the)[g]	41,580	33.0	28.7	41.7	32.7	47.5	34.5	67,595	≥67,595	1,049	21,818	≥21,818	h

Region	Autologous Fresh IVF and ICSI (excl PGT)						Autologous FET	Autologous and heterologous Fresh + FET plus PGT				
	Aspirations excluding freeze-all embryos	PR/Asp (%)[a]	DR/Asp (%)	Cumul. DR/ Total Aspirations (%)	Infants/Asp Fresh (%)[b]	Cumul. Infants/ Total Aspirations (%)[b]	Infants/FET (%)[b]	Reported overall total number of cycles[c]	Estimated or reported overall total number of cycles[a]	Availability Cycles/ million[d]	Total infants reported from participating clinics[e]	Total infants estimated from all clinics
Africa	18,661	35.8	22,6	24.8	34,3	44.8	29.7	29,895	≥36,723	60	5,896	≥8,384
Asia	≥416,836	34.0	27,1	35.4	9.9	40.9	26.4	1,450,932	≥1,611,922	529	343,016	≥352,808
Australia and New Zealand	31,851	22.3	17.8	32.5	18.6	41.0	28.4	77,445	≥77,445	2,820	15,184	≥15,184

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TABLE 4

Continued.

	Autologous Fresh IVF and ICSI (excl PGT)						Autologous FET	Autologous and heterologous Fresh + FET plus PGT				
Region	Aspirations excluding freeze-all embryos	PR/Asp (%)[a]	DR/Asp (%)	Cumul. DR/ Total Aspirations (%)	Infants/Asp Fresh (%)[b]	Cumul. Infants/ Total Aspirations (%)[b]	Infants/FET (%)[b]	Reported overall total number of cycles[c]	Estimated or reported overall total number of cycles[a]	Availability Cycles/ million[d]	Total infants reported from participating clinics[e]	Total infants estimated from all clinics
Europe	≥476,681	28.4	21.1	29.7	26.7	40.9	29.9	914,863	≥980,039	1,295	187,447	≥229,203
Latin America	29,311	27.3	20.5	25.5	26.1	47.5	33.6	78,139	≥97,844	171	18,744	25,607
Middle East (Israel)	≥41,143	NAp	NAp	NA	NAp	NAp	NA	41,143	≥41,143	5,033	NA	0
North America	66,938	35.0	27.9	47.7	33.3	72.8	46.3	215,546	255,332	710	76,901	91,840
Total	≥1,081,421	30.9	23.8	33.1	22.9	44.4	30.5	2,807,963	≥3,100,448	576	647,188	≥723,026

Note: Cumulative rate per aspiration, computed by adding the FET deliveries and infants to those obtained after fresh cycle, the sum being divided by the number of aspirations. Freeze-all cycles excluded from fresh autologous cycles. The total numbers and numbers by region were calculated only from the countries where data are available in the world report using weighted mean method for rate metrics and summation for absolute values. DR = delivery rate; ICMART = International Committee for Monitoring Assisted Reproductive Technologies, NA = not available; NAp = not applicable; PR = pregnancy rate.

[a] Initiated cycles overall countries estimation. Step 1: Reported cycles for countries reporting them, or estimation by applying their cancellation rate to the aspiration numbers for the countries not reporting them. Step 2: Total of step 1 if either 100% of the cycles/centers reported or the cycle reporting/center participation rate is <33%; otherwise, estimation by applying the percentage of reported cycles/participating centers to this total. Step3: Where the ICMART Regional Representative provides an informed estimate for the overall total number of cycles performed in a country, the metric derived in Step 2 will be replaced with the informed estimate. The confidence in the estimation is highlighted in the last column of the table.

[b] Scenario 1: The number of total deliveries, singleton deliveries, twin deliveries and triplet+ deliveries are available and lost to follow-up deliveries is zero. The number of infants is calculated from the country-specific number of singletons, twins and triplet+ deliveries. Scenario 2: The number of total deliveries, singleton deliveries, twin deliveries and triplet + deliveries are available and lost to follow-up deliveries more than zero. The number of singletons, twins, triplets+ is calculated using the country-specific number of singletons, twins and triplets+ deliveries. In addition, an estimate of singleton, twin and triplet deliveries that were lost to follow-up is made based on the country-specific distribution of reported singletons, twins and triplets+. The metrics reported in Columns 6-8 are based on the sum of reported singletons, twins, triplets+ plus the estimated number of lost-to-follow-up infants. Scenario 3: Where a country does not report singleton, twin, and/or triplet+ deliveries, the metrics in Columns 6-8 will be reported as "NAp"; or as "NA" if both nominator (infants) and denominator "aspirations" are "blank".

[c] The reported overall total number of cycles is a summation of fresh IVF initiated cycles, fresh ICSI initiated cycles, thaw cycles in form 2a in the data collection form (DCF); initiated preimplantation genetic diagnosis (PGD; now PGT-M) cycles in form 7a and initiated PGS (now PGT-A and PGT-SR) cycles in form 7b in the DCF; fresh oocyte donation (OD) transfer in form 8b and FET OD transfer in form 8c in the DCF.

[d] Total estimated or reported number of cycles in the country (Column 10) divided by its population in 2015 (CIA World Fact Book)

[e] Total infants reported from participating clinics is a summation of the reported number of infants after fresh and frozen embryo transfer, PGD, PGS, and fresh and FET OD cycles.

[f] Confidence in estimated or reported overall total number of cycles:

[g] Estimated or reported overall total number of cycles calculated based on rate of reporting based on cycles, not centers

[h] ≥95% of cycles/centers reported (certain confidence)

[i] modest confidence estimate (33%–65% of cycles/centers reported)

[j] The reported overall total number of cycles is a summation of initiated IVF + initiated ICSI + Thaw cycles + PGD initiated + PGS initiated + OD fresh ET + OD FET. Where initiated cycles/thaw cycles were not reported, these were imputed from aspirations and FET by applying weighted average cancellation rate of all the countries reporting both.

[k] Total number of cycles and infants based on reported number of cycles and infants because the rate of reporting based on centers is <33% and an informed estimate of the total number of cycles was not available

[l] high confidence estimate (66%–94% of cycles/centers reported).

[m] Informed estimate of the total number of cycles obtained from ICMART Regional Representative.

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2015 and 576 treatment cycles per million population in 2016, with large variations among countries and regions. In 2016, the highest utilization was in Israel: 5,033 ART treatment cycles per million; and the lowest in African countries: often <50 cycles per million.

The number of infants reported from participating clinics in 2015 was 548,652, rising to an estimated ≥675,134 infants after accounting for missing data. The number of infants reported for 2016 was 647,188, with an estimated number of ≥723,026 (Table 4).

Number and type of procedures. In 2016, Asia performed 52% of all estimated cycles, followed by Europe with 32% and North America with 8% (Table 4). In 2016, China reported the greatest number of estimated ART treatment cycles globally (≥919,826 treatment cycles; 30%), followed by Japan (≥459,968 cycles; 15%) and the United States (≥224,962 treatment cycles; 7%).

There were 728,771 reported FET cycles globally in 2015, compared with 906,675 in 2016, which represents a 24% increase but with wide country and regional variation (Tables 1 and 2). Asia performed 61% of all FETs, followed by Europe (26%) and North America (6%).

The proportion of aspiration treatment cycles reported to have used ICSI to aid fertilization was 57.7% in 2015 and 56.4% in 2016. There was an overall decrease in 2015 and 2016, but this is because of the inclusion of data from China for the first time (Fig. 2). Given the number of cycles in China, China has a high impact on global results. This is especially germane to the proportion of multiple births in Asia, which is much higher than the data reported before 2015, when Japan predominated in the Asia proportion of ICSI and IVF. China reported that ICSI was used in 29.2% of aspiration cycles in both 2015 and 2016, compared with 72% in Europe and 79% in North America.

There were 61,303 initiated PGT treatment cycles reported in 2015 and 83,334 in 2016, 46.3% and 45% were reported in the United States in 2015 and 2016, respectively. Preimplantation genetic testing increased 441% from 12,661 in 2010 to 55,784 in 2016, although PGT represented only 5.0% of all reported ART treatment procedures in 2016.

There were 97,080 reported fresh and frozen oocyte donation transfer cycles in 2015 and 114,849 in 2016. In 2016, Spain performed 34.4% of all oocyte donation (39,530/114,849 treatment cycles) (Supplemental Tables 6 and 21).

ART treatment effectiveness

The 2015 reported global pregnancy and delivery rates per aspiration for autologous fresh IVF and ICSI treatment cycles were 31.1% and 23.7%, respectively; in 2016, the rates were 30.9% and 23.8%, respectively (Tables 1 and 3). In 2015, the pregnancy and delivery rates per fresh ET were 37.5% and 29.1%, compared with 39.3% and 29.6% after FET (Table 3). Pregnancy and delivery rates in 2016 were 37.9% and 29.3%, respectively, after fresh ET and 40.6% and 30.4% after FET (Table 4).

From 2010 until 2016, pregnancy and delivery rates per FET increased from 29.1% to 40.6% and from 20.7% to 30.4%, respectively (Fig. 3). These values varied greatly among countries depending on the age and prognosis of the women treated, physician preference for performing either fresh or FET cycles, and the average number of embryos transferred per cycle (Supplemental Table 19). Freeze-all cycles (with no fresh transfer and FET as the first transfer after retrieval) were excluded from the denominator of the fresh autologous aspiration treatment cycles.

Pregnancy per fresh ET continued to rise, although pregnancy per FET rose even more, likely representing the fact that FET was performed more often in better-prognosis patients who had sufficient good-quality embryos to freeze and/or to perform PGT.

The estimated cumulative delivery rate per aspiration was calculated as the number of autologous fresh plus FET deliveries divided by all aspirations, excluding PGT. The estimated cumulative delivery rate increased from 27.1% in 2010 to 32.4% in 2015 and to 33.1% in 2016 (Tables 1 and 3).

With wide regional and country variations, 27.6% (58,397/211,981) and 27.8% (55,021/198,164) of women undergoing fresh autologous treatment cycles in 2015 and 2016, respectively, were aged ≥40 years (Supplemental Tables 9 and 24). These outcome data compare with 23.2% in 2010. The global pregnancy rate per transfer in women aged ≥40 years in 2015 was 15.8% per fresh IVF and ICSI treatment cycle and 23.4% per FET. For 2016, the rates were 15.6% and 23.3%, respectively.

Across women of all age groups, the rate of early pregnancy loss after fresh ET and FET were similar in 2015 and 2016; 2015: 20.5% and 23.9% and 2016: 20.9% and 23.6%, respectively (Supplemental Tables 8 and 23).

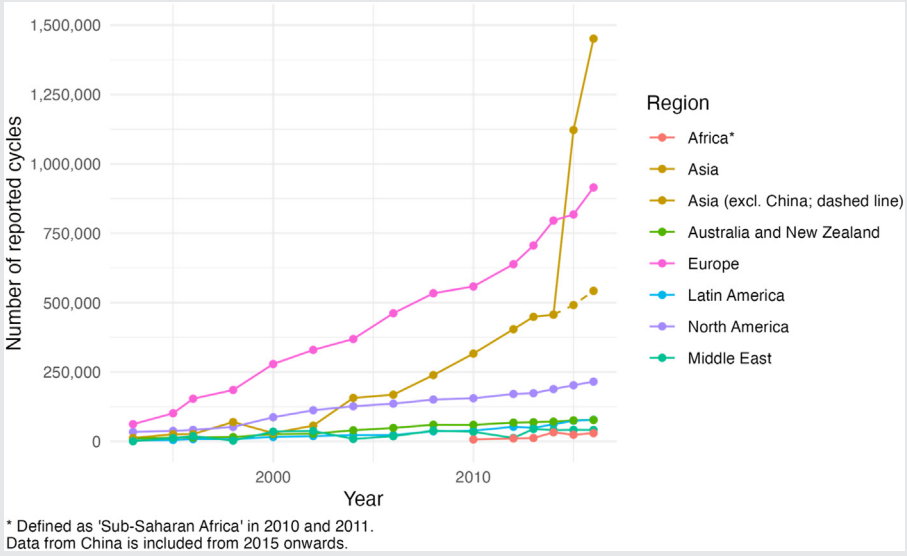
ART treatment safety

The average number of transferred embryos in fresh nondonor and FET cycles decreased from 1.70 and 1.40, respectively, in 2015 to 1.69 and 1.41, respectively, in 2016 (Supplemental Tables 3 and 18).

In 2015, the global single ET rate for fresh autologous transfers was 42.1%, and for FET, the single ET rate was 62.2%. These compare with double ET rates of 47.5% and 32.9% in fresh and FET cycles, respectively. In 2016, the single embryo transfer rate for fresh autologous transfers was 44.0% and for FET was 64.2%. Double ET rates for fresh autologous transfers and for FET were 46.2% and 31.3%, respectively (Supplemental Tables 3 and 18). The rates for three and more than three embryos transferred in fresh autologous ART treatment cycles dropped to 9.1% and 2.1%, respectively, in 2015, and to 8.1% and 1.5%, respectively, in 2016. In FET nondonor cycles, the trend continued: 3.6% and 0.4% in 2015, and 3.1% and 0.3% in 2016, respectively (Supplemental Tables 4 and 19).

In 2016, the multiple delivery rate was 15.1% after fresh autologous transfers, 10.2% after autologous FET, 19.6% after fresh and frozen oocyte donation transfers, and 8.6% after transfers after PGT (Supplemental Tables 5 and 20). These rates compare to 2010: 21.5% after fresh autologous ETs, 12.0% after autologous FET, 29.1% after fresh and frozen oocyte donation transfers, and 21.6% after PGT. At the

FIGURE 1



Number of assisted reproductive technology treatment cycles by region, International Committee for Monitoring Assisted Reproductive Technologies, 1993–2016.

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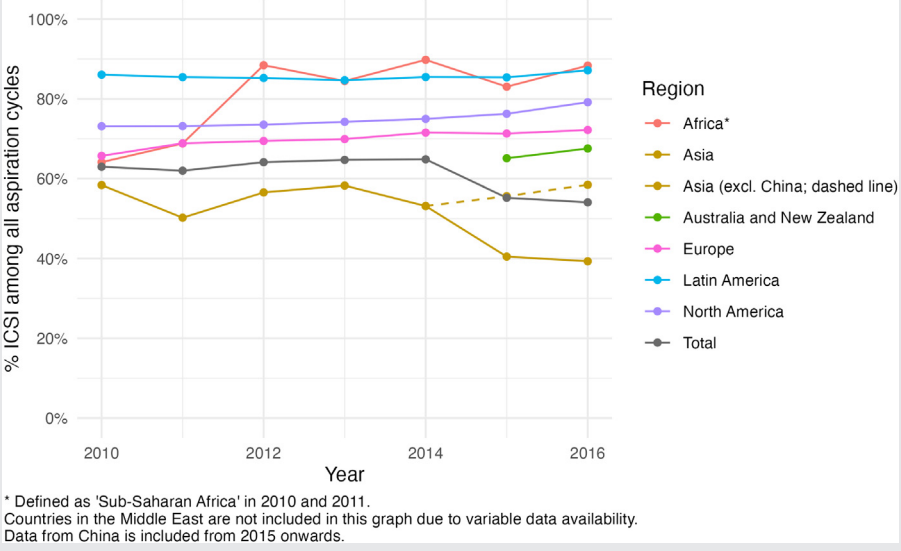
regional level in 2016, multiple delivery rates varied from 31.3% after fresh autologous ET in Africa to 4.1% in Australia and New Zealand. In 2016, multiple delivery rates after oocyte donation transfers ranged from 37.1% in Africa to 3.9% in Australia and New Zealand. Regional means hid large variations among countries within the same regions. The multiple delivery rates for 2015 were marginally higher (Supplemental Table 3).

In 2015 and 2016, the preterm delivery (<37 weeks gestational age) rates after fresh ET were 19.5% and 19.1%, respectively. The respective preterm delivery rates after FET were 15.6% and 16.0% (Supplemental Tables 8 and 23). In 2016,

FIGURE 2



Proportion of aspiration cycles with intracytoplasmic sperm injection (ICSI) by region, International Committee for Monitoring Assisted Reproductive Technologies (ICMART), 2010–2016.

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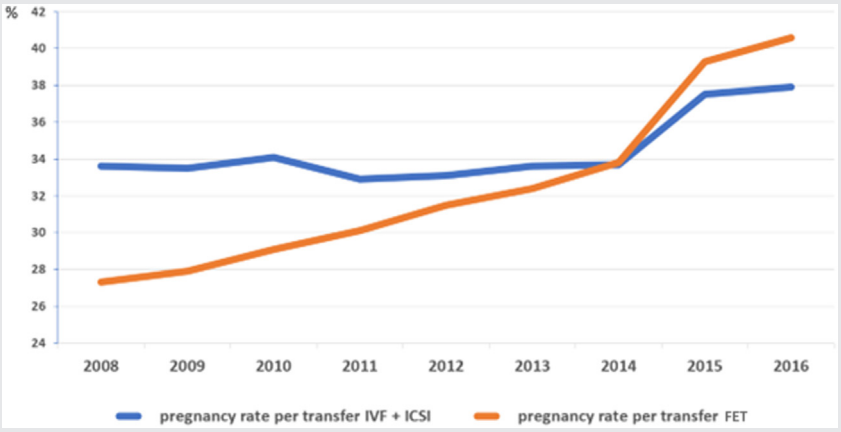
FIGURE 3



Pregnancy rates per transfer in fresh and frozen embryo transfer (FET) cycles over 8 years. ICSI = intracytoplasmic sperm injection; IVF = in vitro fertilization.

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the perinatal mortality (fetal or neonatal death occurring during late pregnancy at 22 completed weeks of gestational age and later), during childbirth, or up to 7 completed days after birth rate was 13.6 per 1,000 births after fresh autologous ART treatment and 9.0 per 1,000 after autologous FET (Supplemental Tables 8 and 23).

The risk of ovarian hyperstimulation syndrome requiring medical intervention, so moderate or severe, remained <1% in both years: 0.9% per cycle in 2015 and 0.7% in 2016. (Supplemental Tables 7 and 22).

Oocyte donation and PGT

In 2015, 56 countries reported a total of 97,080 oocyte donation transfer cycles, both fresh and frozen. In 2016, 57 countries reported 114,849 oocyte donation transfer cycles (both fresh and frozen) (Supplemental Tables 6 and 21). The cycles reported in 2016 represent an increase of 233% since 2010. Most of the global oocyte donation aspirations were performed in Europe: 71.2% (31,511/44,230) in 2015 and 68.8% (33,406/48,577) in 2016. In 2015 and 2016, oocyte donation and fresh ET cycles represented 6.7% and 7.1% of all ET cycles without PGT, respectively. In 2015, oocyte donation resulted in >19,621 infants and a combined delivery rate per transfer after fresh and frozen transfers of 34.2%. In 2016, this increased to ≥47,946 infants with a delivery rate of 33.2%. Most oocyte recipients were aged >40 years: 59.8% in 2015 and 69.6% in 2016 (Supplemental Tables 6 and 21).

In 2015, 42 countries reported 44,010 PGT transfer cycles, resulting in a 44.6% delivery rate per transfer and a multiple delivery rate of 11.4%. In 2016, 36 countries reported 55,784 PGT transfer cycles, resulting in a 46.1% delivery rate per transfer and a multiple delivery rate of 8.6% (Supplemental Tables 5 and 20). Preimplantation genetic testing is increasing in every country where it is allowed. It is probably higher in the United States compared with European countries because the United States has less restrictive regulations, more patient autonomy, and a different health system financial model.

IUI

In 2015, 27 countries reported IUI using husband sperm in 285,060 treatment cycles. In 2016, 40 countries reported 294,362 treatments (Supplemental Tables 13 and 28). In 2015, the pregnancy, delivery, and multiple delivery rates were 11.8%, 8.8%, and 8.2%, respectively. In 2016, these rates were 12.6%, 9.8%, and 7.7%, respectively.

In 2015, 23 countries reported 80,699 donor sperm IUI cycles, compared with 34 countries and 43,138 IUI cycles reported in 2010. In 2016, 37 countries reported 89,490 treatments (Supplemental Tables 14 and 29). In 2015, the delivery rate per IUI cycle was higher in donor sperm cycles than in IUI cycles using husband sperm: 15.4% vs. 8.8%. In 2016, the delivery rates were 15.9% vs. 9.8%, respectively, (Supplemental Table 14 and Supplemental Table 29).

Cross-border care

Nineteen countries in 2015 and 18 countries in 2016 reported cross-border reproductive care (Supplemental Tables 15 and 30). Most of these countries were in Europe. Reasons for receiving treatment in another country were similar in 2015 and 2016: access to nondonor IVF and ICSI treatment (8,303 treatment cycles) and access to oocyte donation (8,346 treatment cycles). In 2016, this included 8,833 treatment cycles and 10,578 treatment cycles, respectively (Supplemental Table 30). Reported anonymous oocyte donation cycles increased from >2,955 in 2013 to >10,578 in 2016, with Spain offering 6,893 treatment cycles in 2016. Spain reported the highest number of cross-border reproductive care treatment cycles, followed by the United States. A

large proportion of egg donations in Spain result from cross-border reproductive care because egg donation is restricted in many European countries.

DISCUSSION

This 20th sequential annual ICMART World Report on global ART treatment utilization, effectiveness, and safety during 2015 and 2016 represents a continuous surveillance of ART treatment globally since 1989. A record number of countries contributed: 74 in 2015 and 79 in 2016, with China contributing for the first time in 2015.

The number of ART treatment cycles performed globally continues to increase. In 2016, there were an estimated >3.1 million cycles, resulting in the birth of >723,000 infants. The International Committee for Monitoring Assisted Reproductive Technology considers that these outcomes likely represent at least 80% of global activity. Several countries, largely from the Middle East and some from Asia, did not submit data for the surveillance period.

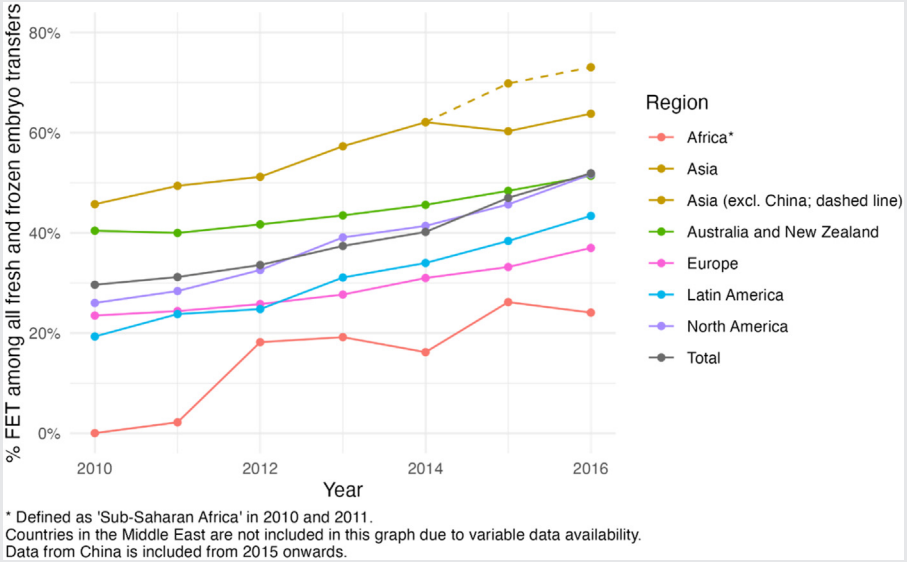
The total global activity in 2016 is estimated to have been 3.9 million ART treatment cycles and >900,000 infants. The inclusion of data from China has improved our global and regional understanding of ART treatment-related activity because China accounted for 27% and 30%, respectively, of the estimated cycles in 2015 and 2016. The principal trends in global ART treatment practices from 2010 to 2015 and 2016 are the increase in the proportion of FET cycles (Fig. 4) and the increase in FET delivery rates, the steady improvement in cumulative delivery rates per aspiration, the continued increase in single ET and reduction in multiple birth rates, and the increased uptake of PGT associated with more single ET. Excluding China, the proportion of ICSI remained stable. Including China, the proportion of ICSI decreased significantly.

The global per capita utilization rate of ART continues to trend upward, from 474 cycles per million in 2010 to 579 cycles per million in 2016. However, extreme variation in utilization exists among countries. Utilization rates of >3,000 cycles per million were reported in Israel, Belgium, the Czech Republic, Denmark, Australia, and Japan, whereas rates <100 cycles per million were reported in most low-resource countries.

This marked difference in utilization rates occurs despite a similar prevalence of infertility in different regions of the world. A recent review by the World Health Organization estimated a lifetime prevalence of infertility of 17.8% and 16.5% in high- and low-to-middle-income countries (LMICs), respectively (9). The disparity in access to ART treatment highlighted by successive ICMART reports underscores the need to advocate for equitable and affordable access to high-quality ART treatment for those suffering from infertility, especially in LMICs. It is these women who often bear a significant social, cultural, economic, and physical burden for not being able to bear a child (10, 11).

The right to "found a family" was declared a human right in 1948 (12), and infertility is recognized as a disease by a number of international organizations, including the World Health Organization (13). However, access to care remains unaffordable and inaccessible, particularly for minority women in both high-income and LMICs. A recent analysis using longitudinal data from the ICMART World ART Registry from 2002 to 2014, combined with indices from the United Nations Development Programme and the World Bank, clearly demonstrated that as gender equality improves in a country, so does access to ART treatment (14). The analysis showed that although access to ART treatment varies dramatically across the globe, the

FIGURE 4



Frozen/thaw embryo transfer (FET) cycles as a proportion of all embryo transfer cycles by region, the International Committee for Monitoring Assisted Reproductive Technologies (ICMART), 2010–2016.

Kupka. ICMART world report on ART 2015 and 2016. Fertil Steril 2024.

variation is not attributable solely to differences in economic development among countries. Rather, variations in gender equality also play a role, with greater gender equality associated with higher ART treatment utilization.

The relationship between the determinants of gender equality and fertility care is complex and likely bidirectional, with reproductive health and women's rights highly intertwined. Indeed, reproductive health has been reported as the largest contributor to gender inequality (15). As recognized by organizations such as the United Nations and the World Health Organization, and more recently in a consensus statement from the International Federation of Fertility Societies (IFFS), access to affordable fertility treatment as part of broader reproductive care is paramount to women and girls rights (16–18). In line with this principle, ICMART has proposed that ART utilization, as described in its world reports, be considered the global indicator of access to infertility care so that progress on equitable reproductive healthcare goals can be measured (19). Although ART utilization is not a perfect indicator and ART treatment is only one form of infertility care, ART is the most well documented intervention through regional and national registries and reflects an integral component of quality fertility care.

In another recent development highlighting the importance of ART treatment surveillance, the European Union started a project in 2021 in cooperation with the European IVF Monitoring consortium of the European Society of Human Reproduction and Embryology to establish a registry for the transnational collection of prospective cycle-by-cycle medical assisted reproduction and fertility preservation data on the basis of an individual reproductive care code (20, 21). Although national and transnational cycle-by-cycle-based monitoring is in place in other world regions, such as Latin America, most of Africa, Australia-New Zealand, and North America, the European Union medical assisted reproduction project will provide an important opportunity for mutual learning regarding best practices in ART treatment monitoring and its impact on patient care.

The data presented in this report depend on the quality and completeness of data submitted by individual countries and entities. The collection, collation, validation, analysis, and publication of disparate and incomplete global data are complex. We have introduced several strategies in ongoing world reports to expedite both the data collection as well as the data clearance and validation. Although approximately 10% of data are imputed, we believe that this imputation is acceptable given that most countries do not have an obligatory national data collection system. In countries where some of the requested information is not collected or provided, the imputations help to give a more accurate comparison of the global situation. Imputed and reported outcomes are assumed to have the same distribution. Although possible data errors and inconsistencies are queried with country representatives with extensive registry experience, further validation of the data are not feasible. The quality and completeness of the data reflect local data collection practices (e.g., voluntary vs. mandatory reporting, prospective cycle-based reporting vs. retrospective summary-based reporting) and vary among countries and regions. This report covers approximately 80% of the global ART treatment-related activity, making it the most comprehensive report on global ART treatment-related activity.

CONCLUSION

The ICMART World Reports have provided the most comprehensive global statistical census and review of ART utilization, effectiveness, and safety since 1989. To continuously monitor ART practices and outcomes internationally is essential to advocating for equitable access to reproductive care through the surveillance of utilization levels, monitoring treatment effectiveness, and identifying safety issues. The ICMART World Reports are important documents at global, regional, and local levels to inform policy development, clinical practice, education, and advocacy.

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CRediT Authorship Contribution Statement

Markus S. Kupka: Writing – review & editing, Writing – original draft. **Georgina M. Chambers:** Writing – review & editing. **Silke Dyer:** Writing – review & editing. **Fernando Zegers-Hochschild:** Writing – review & editing. **Jacques de Mouzon:** Writing – review & editing. **Osamu Ishihara:** Writing – review & editing. **Manish Banker:** Writing – review & editing. **Seung Chik Jwa:** Writing – review & editing. **Bai Fu:** Writing – review & editing. **Eman Elgindy:** Writing – review & editing. **Valerie Baker:** Writing – review & editing. **G. David Adamson:** Writing – review & editing.

Declaration of Interests

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Epidemiology and Statistics Unit (NPESU) of the University of New South Wales, Sydney (UNSW) received funding. S.D. has nothing to disclose. F.Z.H. reports travel expenses to give a scientific lecture from Ferring Pharma, Director, responsible for the Latin American Registry of ART, Chair Committee of Ethics and Public Policies; Chilean Society of Obstetrics and Gynecology, Vice Chair ICMART, outside the submitted work. J.D.M. is Chair of Société de Médecine de la Reproduction, France, unpaid, outside the submitted work. O.I. has nothing to disclose. M.B. reports consulting fees from ABBOTT INIDA; honoraria from BAZEL PHARMA and MERCK SPEC; Board of Director, Pacific Rim Society of Reproductive Medicine; Board of Director, POSEIDON Group; Regional Director, IFFS Triennial Report, outside the submitted work. S.C.J. reports travel fee for lectures supported by Ferring; travel support from the Japan Society for Reproductive Medicine for attending meetings, outside the submitted work. B.F. has nothing to disclose. E.E. has nothing to disclose. V.B. reports consulting fees from Organon, Society for Assisted Reproductive Technology Executive Council, not paid, outside the submitted work. G.D.A. reports honoraria from Organon; travel support from ESHRE; Chair, International Committee for Monitoring ART. unpaid; President, World Endometriosis Research Foundation, unpaid; ICMART NGO Liaison Observer, Board of the International Federation of Fertility Societies, unpaid; ASRM: Member, Global Health Committee, American Society for Reproductive Medicine, unpaid; founder and CEO of Advanced Reproductive Care, Inc. (d/b/a ARC®Fertility), outside the submitted work.

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Informe mundial del Comité Internacional para el Seguimiento de la Tecnología de Reproducción Asistida: tecnología de la reproducción asistida, 2015 y 2016

Objetivo: Informar sobre la utilización, eficacia y seguridad de las tecnologías de reproducción asistida en 2015 y 2016.

Diseño: Una encuesta retrospectiva transversal de 3.103 clínicas de técnicas de reproducción asistida en 74 países en 2015 y 3.249 clínicas en 79 países en 2016 que presentaron datos de ciclos y resultados de embarazos a través de registros nacionales y regionales.

Escenario: Setenta y nueve países y >3.000 clínicas de técnicas de reproducción asistida.

Pacientes: Pacientes sometidos a procedimientos de tecnología de reproducción asistida.

Intervención: Tecnología de reproducción asistida.

Principales medidas de resultados: Resultados por país, región y a nivel global.

Resultados: Reportados para 2015: 2.358.239 ciclos con 548.652 bebés nacidos; para 2016: 2.807.963 ciclos con 647.188 bebés nacidos. Estimados para 2015, ≥.2.683.677 ciclos dieron lugar a >675.134 recién nacidos; en 2016, ≥3.100.448 ciclos dieron lugar a ≥723.026 recién nacidos. Los ciclos notificados representan aproximadamente el 80% de la utilización mundial. En 2015 y 2016, el 27,6% y el 27,8%, respectivamente, de las mujeres que se sometieron a ciclos de tratamiento autólogo en fresco, tenían ≥40 años. Los ciclos de transferencia de embriones (TE) congelados-descongelados representaron el 47,0% y el 51,9%, respectivamente, de todas las TE en 2015 y 2016. Los ciclos de donación de ovocitos supusieron el 6,7% y el 7,1% de todas las TE en 2015 y 2016. La inyección intracitoplasmática de espermatozoides se realizó en el 57,7% y 56,4% de los ciclos de aspiración autóloga en 2015 y 2016, respectivamente. La tasa acumulada de partos por ciclo de aspiración para TE en fresco y ciclos de transfer de embriones congelados-descongelados fue del 32,4% en 2015 y del 33,1% en 2016, respectivamente. El número medio de embriones transferidos fue de 1,70 en 2015 y de 1,69 en 2016. La proporción de TE únicas en ciclos en frescos autólogos aumentó del 42,1% en 2015 al 44,0% en 2016. La tasa de partos gemelares disminuyó del 16,0% en 2015 al 14,7% en 2016, y la tasa de trillizos disminuyó del 0,6% en 2015 al 0,4% en 2016. La proporción de TE únicos en los ciclos de TE congelados-descongelados autólogos fue del 62,2% en 2015 y del 64,2% en 2016, con unas tasas de gemelos y trillizos del 10,1% y el 0,3% en 2015 y del 10,0% y el 0,2% en 2016, respectivamente.

Conclusiones: La utilización de tratamientos de reproducción asistida y los nacimientos por ciclo aumentaron de 2015 a 2016, aunque se redujeron los nacimientos múltiples. Se ha notificado un aumento de la proporción de ciclos de TE congelados y descongelados, se siguen reportando grandes variaciones en el uso de la inyección intracitoplasmática de espermatozoides y un aumento de las tasas de TE única.