

The effect of the liberalization of the sale of emergency contraception on the reproductive behavior of Italian women

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During the period 2011-17 in Italy the number of conceptions, births and abortions continued to decrease (Table 1). Part of this decline is due to the decrease in women of childbearing age, as the baby boomers – born in 1955-74 – have concluded the reproductive life. However, the reduction of potential mothers does not explain everything, because in the same period the birth, abortion and conceptions rates, as well as the abortion ratio (the probability for a conception to end with an abortion) also decrease in a not negligible way.

Table 1. Conceptions and outcomes of conception in Italy in 2011-17. Absolute values and indicators

June-May	Women 15-49	Outcomes			Rates x 1.000 women 15-49			Abortion Ratio x 100 Conceptions
		Conceptions	Births	Abortions	Conceptions	Births	Abortions	
2011-12	13,523,351	640,930	532,954	107,976	47.4	39.4	8.0	16.8
2012-13	13,440,975	610,852	510,571	100,281	45.5	38.0	7.5	16.5
2013-14	13,551,316	595,611	498,533	97,079	44.0	36.8	7.2	16.4
2014-15	13,365,818	575,402	483,535	91,866	43.1	36.2	6.9	16.0
2015-16	13,160,012	555,181	470,924	84,330	42.2	35.8	6.4	15.2
2016-17	12,945,219	540,451	458,149	82,302	41.7	35.4	6.4	15.2

Note. The pregnancies concluded with a birth are calculated anticipating by nine months the monthly births registered in the Municipal Registry Office, the pregnancies concluded with an abortions are calculated anticipating by two months the monthly abortions recorded at the hospitals with the Istat form D12. The female population 15-49 is published by Istat on the first of January of the second year of the indicated two-year period (average population of the period). We do not consider either miscarriages or illegal abortions.

Sources: For population and births: demo.istat.it. For abortions: "Istat, Indagine sulle interruzioni volontarie della gravidanza", several annual editions.

The reduction in abortion rates and abortion ratios is in continuity with a decades-long trend, linked to the gradual decline of the *coitus interruptus* and to the spread, even in Italy, of modern contraception (Castiglioni and Dalla-Zuanna 2010; Castiglioni 2013; Loghi et al. 2013; Istat 2017). However, the drop of the abortion ratio between 2014-15 and 2015-16 is striking, accentuating the trend observed in the previous years and decades and not repeated in the following year. Since – as we will see better shortly – in March 2015 and in May 2016 in Italy the sale of post-coital contraceptives was liberalized, we want to observe the effect that this contraceptive novelty has had on the reproductive behavior of Italian women.

This paper is divided into three parts. First, using the data kindly made available by AIFA (The Italian Drug Agency), we describe the sales trend in Italy of post-coital contraceptives between 2012 and 2016. Secondly, we estimate the effect that such contraceptives may have had in reducing conceptions. Finally, using regression statistical models, we measure the effect of sales liberalization on the abortion ratio.

The liberalization of the sale of *EllaOne* and *Norlevo*

From the beginning of 2012, in Italy the so-called "5-days morning-after pill" has been marketed, based on *ulipristal acetate*, trade name *EllaOne*. It is a post-coital contraceptive sold in single-dose pack, which in 2017 cost 27 euros per pack. If taken within 120 hours of sexual intercourse, *EllaOne* can inhibit conception. In May 2015 in Italy the sale of *EllaOne* was liberalized: since

then, for all adults (age 18+), it can be purchased directly at the pharmacy, without any medical prescription. In March 2016, the sale of the "morning-after pill", based the progestin hormone *levonorgestrel*, trade name *Norlevo*, was also liberalized, after being introduced in Italy in October 2006. Since then, for all adults, this drug can be purchased directly at the pharmacy without a medical prescription, sold to the public in single-dose packaging, a cost similar to that of *EllaOne*. If taken within 48 hours after sexual intercourse, *Norlevo* can also inhibit conception.

It is difficult to imagine that many women make systematic use of these contraceptives after each sexual intercourse for various reasons: the cost is relatively high; this use is explicitly not recommended by doctors: the possible side effects are not trivial. It is much more likely that *EllaOne* and *Norlevo* are used as emergency contraceptives, when the woman realizes she has had an unprotected sexual intercourse.¹

Between January 2012 and April 2015, the monthly sales of *EllaOne* and *Norlevo* were almost constant, around 25 thousand (*Norlevo*) and one thousand (*EllaOne*). With the liberalization of sales in April 2015, *EllaOne* has experienced a "boom", exceeding the 18 thousand packages sold in August 2015 and oscillating in the following months between 18 and 22 thousand packs (Figure 1). In 2016, the first full year of *EllaOne* sale liberalization, 237,837 packs were sold in Italy, fourteen times more than the 16,793 of 2014. In contrast, in the period May 2015 – February 2016, the sale of *Norlevo* continued to decline, going to below 13 thousand packs in February 2018, less than half compared to February 2015. It is likely that this was due to the non-liberalization of the *Norlevo* sales: starting from March 2016, when *Norlevo* also becomes an over-the-counter drug, *Norlevo* sales recover rapidly, reaching at the end of 2016 the same levels it had at the end of 2014. The total sale of these two drugs went from 340 thousand packs a year in the three-year period 2012-14 to almost half a million in 2016 (table 2).

Table 2. Norlevo and EllaOne packs sold in the Italian pharmacies over the period 2012-16

	2012	2013	2014	2015	2016
Norlevo	339,405	331,556	322,841	253,658	256,752
EllaOne	7,796	11,915	16,798	145,553	237,837
Total	347,201	343,471	339,639	399,211	494,589

Source: Our elaborations on data kindly supplied by AIFA – Italian Drug Agency

Table 3. Estimation of pregnancies avoided by Norlevo and EllaOne in Italy over the period 2012-16

	2012	2013	2014	2015	2016
Norlevo	9,673	9,449	9,201	7,229	7,317
EllaOne	284	434	611	5,298	8,657
Total	9,957	9,883	9,812	12,527	15,975

Source: Our elaborations on data kindly supplied by AIFA – Italian Drug Agency

The effect of post-coital contraception on conception decline

We estimate the number of conceptions avoided by post-coital contraception in 2012-2016. The estimate of the average probability of conception for an unprotected sexual intercourse is 5.00%.² According to the meta-analysis of Glasier *et al.* (2010), this probability drops to 2.15% if *Norlevo* is used, to 1.36% if *EllaOne* is used. Thus, the conceptions avoided by the two drugs are so reputable:

¹ In Italy, other drugs based on the same active ingredients as *EllaOne* and *Norlevo* are also sold, but their diffusion is negligible.

² The average probability of conception for an unprotected sexual intercourse was obtained by averaging the probability of conception for intercourse in each of the twenty-three days of the menstrual cycle (excluding the period of menstruation), calculated on Caucasian European women who do not use contraceptives (Colombo and Masarotto 2000). The days of menstruation were excluded because at that time only very few women should use *EllaOne*. In fact, at that time most women have not sexual intercourses, and furthermore some investigations have shown that the vast majority of Italian women know that during menstruation it is (almost) impossible to become pregnant (Bonarini 2004).

for *Norlevo* number of packs sold multiplied by (0.05 – 0.0215) and for *EllaOne* number of packs sold multiplied by (0.05 – 0.0136). By applying these formulas to monthly and annual sales data of figure 1 and table 2, we obtain the conceptions avoided by *EllaOne* and *Norlevo* monthly and annually during 2012-16 (Figure 2 and Table 3).

Following the liberalization of sales, the pregnancies avoided annually thanks to post-coital contraception increased by 6,000 units, going from 9,957 in 2014 to 15,975 in 2016, 60% more in the short span of a two-year period. This increase is due on the one hand to the general increase in post-coital contraception, on the other to the partial replacement of *Norlevo* with *EllaOne*, whose contraceptive efficacy is greater, according to the meta-analyses of Glasier *et al.* (2010).

To understand the effect of the increase in post-coital contraception on the decline of conception in the 2013-16 period, we put together the data from table 1 with the results just obtained. From the year 2013-14 (twelve months centered on 1st January 2014) to the year 2015-16 (twelve months centered on 1st January 2016) the conceptions that gave rise to births and abortions decreased by 40 thousand units. As specified at the beginning of this paper, a part of this decline is caused by the decrease in women of childbearing age: if in 2015-16 women had the same conception rate as in 2013-14, due to the decrease in women 15-49 the conception would still have been 17,000 less. So, net of the decrease in women exposed to the risk of conceiving, within two years there were 23 thousand fewer conceptions. It can be estimated that more than a quarter of this decrease (six thousand conceptions) was due to the increase in emergency contraception. The most of outcomes of these missed conceptions are missed abortions, the others missed unintended births.

Figure 1. Monthly sales of EllaOne and Norlevo between Jan 2012 and Dec 2016

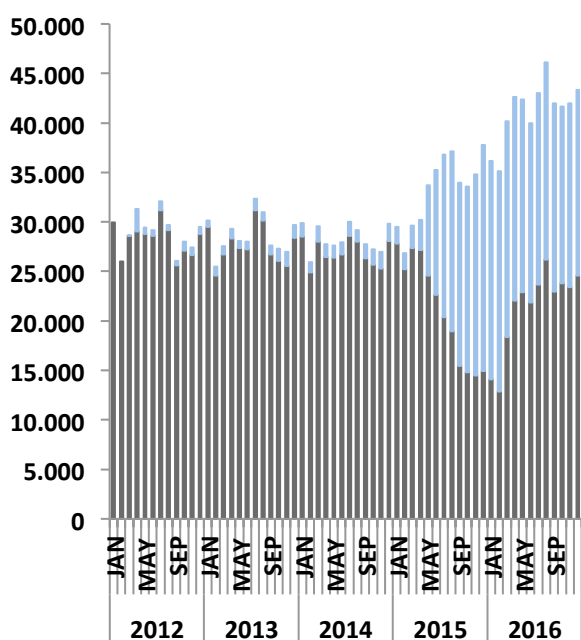
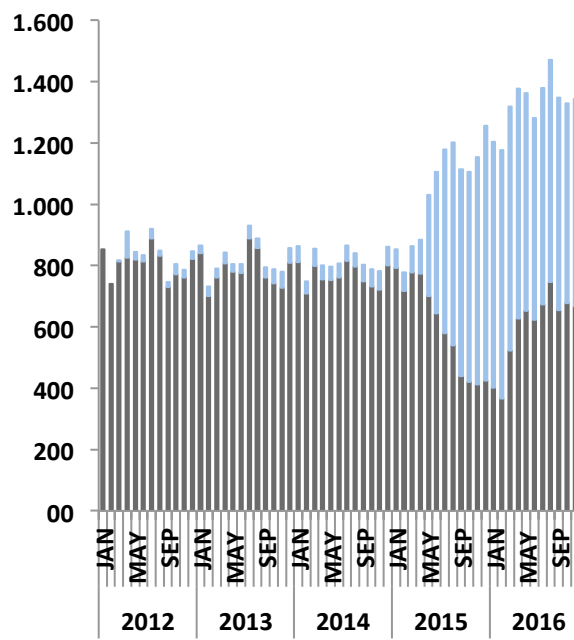


Figure 2. Pregnancies avoided by EllaOne and Norlevo between Jan 2012 and Dec 2016



■ Norlevo ■ EllaOne

Source: Our elaborations on data kindly supplied by AIFA - Italian Drug Agency

Post-coital contraception and abortion ratio

Starting from the individual Istat data-set on births registered in the Municipal Registry Office (Form P4) and on the legal abortions registered in the hospitals (Form D12), we measured the effect of the liberalization of the sale post-coital contraceptive pills on the abortion ratio, through the use of logistic regression models, following this strategy. Starting from the births and abortions recorded in 2014-17, we built the archive of conceptions that occurred in the period February-July

in the years 2014, 2015 and 2016, going back in time as specified in the note of table 1. For each year, we model the outcome of the pregnancy (abortion vs. birth) with a logistic regression considering as covariates the period of the year (February-March-April vs. May-June-July), age in five-years class, citizenship (Italian, foreign), place of residence (North, Center, Southern Italy), marital status (married, single, other state), number of children. The covariate period of the year, as defined above, is of particular interest because – as can be seen in figures 1 and 2 – the months of May-June-July of 2015 were those in which the sale of post-coital pills had a strong surge, just after liberalization of *EllaOne*.

If the sale liberalization affects the abortion ratio, the difference between the abortion ratio in February-March-April and in May-June-July should be greater in 2015 than in 2014 and 2016. This is exactly what happens (see table 4). The abortion ratio in Italy – which has a strong seasonal trend – is always lower for the May-June-July conception than for February-March-April, but the difference is more pronounced in 2015 than in 2014 and 2016, even if differences are not too wide.

Table 4. Relative risk for the abortion ratio (IVG / conception) of May-June-July compared to those of February-March-April. Three logistic models applied to conception in Italy in 2014, 2015 and 2016

	Odds ratio	SE	P
2014	0.918	0.010	0.000
2015	0.852	0.010	0.000
2016	0.972	0.012	0.016

Note: the control variables are age class, citizenship (Italian, foreign), place of residence (North, Center, Southern Italy), marital status (married, single, other state), number of children.

Conclusions

Thanks to the over-the-counter transformation of *EllaOne* (from March 2015) and *Norlevo* (from May 2016), the spread of emergency contraception in Italy has seen a significant increase, going from 30 to 40 thousand single-dose packs per month from 2014 to 2016. We have calculated that this increase – which affected especially *EllaOne*, the one with greater contraceptive efficacy – in 2016 avoided 6,000 more conceptions than in 2014 (16 thousand compared to 10 thousand). We have also calculated that – net of the decline of women of childbearing age – more than a quarter of the decline in conceptions between 2016 and 2014 is due to the greater spread of post-coital contraception. Finally, we also showed how the "shock" induced by the liberalization may have contributed to the reduction of the abortion ratio during 2015. As illustrated by other studies (see e.g. Istat 2017), the drop in the rate of conception and abortion in the early part of the 21st century among Italian women is mainly due at the sunset of *coitus interruptus*, the spread of condoms (especially for occasional and juvenile sexual intercourses) and of pill (especially in the couple's consolidated relationships). However, our results show that the contribution of the liberalization of the sale of post-coital pills was not irrelevant.

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