

## ARTICLE

# Reduced Abortion Rates and Improved Provision of Counseling and Contraception Services: Analysis of a Regional Campaign for Young Women in Italy

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Through its national health system, Italy provides legal and free abortion through the third month for any reason and through the sixth month for maternal or fetal health problems, but one of the public health goals specified in Italian legislation is to minimize its use. One barrier to achieving this goal is inconsistent access to prescription contraception. Six out of 20 Italian regions offer free contraception programs paid for by the national health system. Tuscany was the most recent region to introduce such a program, in November 2018. The authors studied the impact of this program using regional administrative health data to compare the 3-year period before and the 2-year period after its introduction. They computed rates of abortion, contraception uptake, access to counseling centers, conception, and use of outpatient services for sexually transmitted diseases. Their analysis revealed positive effects on teenage conception and on overall utilization of outpatient services for sexually transmitted diseases and strongly suggests that this program has been effective in reducing abortions by promoting access to counseling and contraception services among young women.

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In Italy, abortion is a free service guaranteed to all women for any reason during the first trimester and for maternal or fetal health issues during the second trimester, although individual

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physicians have the right to refuse the procedure on the basis of conscience. In practice, therefore, access varies by region depending on the number of providers who object. Italy had one of the lowest abortion rates among Western European countries in 2019 (5.8 per 1,000 women in Italy, compared with 8.1 in the United Kingdom, 11.5 in Spain, and 15.6 in France), with a gradual downward trend over the past 40 years.<sup>1,2</sup>

However, the lower abortion rates did not correspond to higher use of contraception. In fact, contraception provision in Italy was found to be lower than in most developed European countries, such as England, France, and Spain, with Italian women frequently preferring less reliable contraceptive methods and thus more likely to have unplanned births.<sup>3-5</sup>

Italy's approach to providing contraception is mixed and inconsistent among the country's regions. To try to limit the need for abortion, the public health service provides free family counseling centers to assist pregnant women with problems that may lead them to seek an abortion, such as psychological fragility, lack of family support, or economic troubles.<sup>6,7</sup> However, these centers, which are administered regionally, vary in number, quality, and range of services depending on the region, and only 6 regions out of 20 offer free contraception. At some centers, physicians will see women free of charge or on a sliding scale to provide a prescription, but they must pay out of pocket to fill the prescription. Women can also visit private physicians and pay out of pocket (between 80 and 150 euros for the visit, plus another 15-20 euros per month to purchase, for example, the contraceptive pill), but this avenue is not affordable for many.

In the most recent European Contraception Policy Atlas, the Italian performance on ensuring access to contraception and counseling services was average compared with other European countries,<sup>8</sup> and there was wide variation among Italian regions.<sup>9,10</sup>

In the Tuscany region, abortion rates are tracked by the Performance Evaluation System, designed, developed, and implemented by our institution, the Management and Health Laboratory of Sant'Anna School of Advanced Studies.<sup>11,12</sup> Although abortion rates per 1,000 women had been showing a gradual reduction in recent years, the Regional Council sought ways to reduce them further.

Several successful interventions aimed at reducing abortions by promoting contraception have been described in the literature.<sup>13-15</sup> In November 2018, the Regional Council issued resolution 1251/2018 to launch a public program ensuring free contraception to young men and women living in Tuscany. (Access was also extended to certain other groups on the basis of income and a history of pregnancy, but our study was limited to women aged 14-25 years.)<sup>16</sup> Although contraception was obtainable through family counseling centers before this regional resolution, it was not free of charge, but cost the same as a prescription from a private physician. (See [Appendix A1](#) for further information on the regional resolution.)

This resolution had four aims:

- To contain abortion rates by enhancing contraception provision

- To increase access to free family counseling centers
- To reduce teenage conception
- To limit the spread of sexually transmitted diseases (STDs)

Our study aimed to evaluate the program's impact in these areas.

## Methods

### *Setting*

The Italian National Health Service is based on the principle of free universal coverage and follows a decentralized model.<sup>17</sup> The central government is responsible for setting the overall funding requirements, goals, and priorities and for ensuring equity of care (both access and quality) across its territory. Twenty regions are responsible for the organization and delivery of primary and secondary care services locally. They have a high degree of administrative, political, fiscal, and legislative autonomy; for instance, regions can enact new resolutions valid at the regional level.

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“ *Italy's approach to providing contraception is mixed and inconsistent among the country's regions.* ”

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The Regional Health Care system of Tuscany cares for 3.7 million inhabitants, receiving around 6% of the national health care fund (or about 7 billion euros in 2019). Tuscany is divided into three Local Health Authorities (LHAs) financed by a capitation-weighted budget. According to the last available national assessment by the Italian Ministry of Health, Tuscany ranks among the best Italian regions with regard to quality and appropriateness of care, financial performance, and other measures. This excellent performance extends to family counseling centers. The most recent report by the Italian National Health Institute shows one center per 22,229 inhabitants, placing Tuscany among the four Italian regions with the highest density of counseling centers, much higher than the national average and on track to achieve the legislative goal of one center per 20,000 inhabitants.

### *Study Design*

This population-based retrospective observational study employed routinely collected administrative health data. Therefore, analyses were reported in compliance with the international guidelines for reporting observational studies.<sup>18</sup> To explore the effect of the free contraception regional program, we used interrupted time series (ITS) methodologies,<sup>19</sup> the most reliable quasi-experimental methodologies for measuring the impact of public intervention in a nonrandomized setting.<sup>19</sup> The ITS design allows us to estimate the effects of public health interventions, obtaining results comparable to those of randomized studies.<sup>20,21</sup> The intervention time was set at November 2018.

## Outcomes

The first outcome we measured was change in the abortion rate, including both surgical and medical abortions. The second outcome was the provision rate of hormonal and emergency contraceptives and hormonal copper coils through counseling centers and outpatient clinics. (Although condoms and nonhormonal copper coils were also available, we did not include them in our analysis because they are recorded in a different database that does not include adequate demographic information.) Free contraception is provided after medical evaluation at free counseling centers; therefore, the third outcome was the access rate to counseling centers, computed as the number of women who visited a counseling center for obtaining contraception divided by the residing population.

Our fourth outcome was the conception rate, comprising all births and all induced or spontaneous abortions among young women entitled to free contraception through this program.

Finally, to explore the potential indirect effects of the intervention on the spread of STDs, we considered outpatient service utilization rates for the following STDs: *Chlamydia trachomatis* (CT), *Neisseria gonorrhoeae* (NG), *Treponema pallidum* (TP), herpes simplex virus (HSV), HIV, and human papillomavirus (HPV). We included all kinds of services for STDs that can be provided in outpatient settings, from testing and diagnosis to outpatient treatments.

Because hormonal contraception is a well-known risk factor for venous thromboembolism,<sup>22</sup> we also sought to verify the safety of the regional program at the population level by computing the hospitalization rate for deep vein thrombosis and/or pulmonary embolism among young women residing in Tuscany.

All of these rates were computed from January 2016 to December 2020 and expressed both annually per 1,000 women aged 14–25 years and monthly per 100,000. Each rate was also calculated in each of the three LHAs of Tuscany separately to explore how the regional resolution was implemented locally. We also stratified for age group (18 years or younger or over 18 years) and nationality (Italian or non-Italian), modifying the denominator accordingly, to analyze the effectiveness of the regional intervention on subgroups that may access and use outpatient and counseling services differently. Statistical models for monthly outcomes were adjusted for monthly Covid-19 infection rates as a proxy of the health system burden during the pandemic to identify increased difficulties in accessing abortion services that might lead to an undesired reduction in abortion rates.

## Data Source and Population

Data were obtained from the Regional Health Service of Tuscany's administrative databases. Records from different databases were linked by date (month and year). According to the Italian law on privacy and the European General Data Protection Regulation (GDPR), patient consent and ethics approval were not required.<sup>23</sup>

Women aged 14–25 years receiving an abortion were selected from the Voluntary Termination of Pregnancy (VTP) Database, which comprises all women terminating pregnancy every year in Tuscany, regardless of the setting in which the service is provided.

Hormonal contraceptives dispensed to young women in outpatient and counseling centers were selected from the regional Directly Provided Drugs Database using the appropriate Anatomical Therapeutic Chemical 5 codes (see [Appendix Table A1](#)). Because contraceptives provided by pharmacies were not included in the regional program, we did not include them in our analysis.

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“ *The Regional Council issued resolution 1251/2018 to launch a public program ensuring free contraception to young men and women living in Tuscany.* ”

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In addition, young women accessing counseling centers for obtaining contraception were identified from the Counseling Services Database of Tuscany, in which all women visiting family centers for any reason are recorded individually. We used the appropriate code (O1) for the contraception area.

Hospital discharge records were used to compute conception rates among young women. We included all births and all abortions ([Appendix Table A1](#)). Until August 2020, all abortions, whether medical or surgical, required hospitalization. In August 2020, the law was changed to allow medical abortions to be performed in outpatient settings. We may have lost some observations of induced abortions between August 2020 and the end of the study period, but we do not believe the numbers involved would invalidate our overall results.

Young women using outpatient health services for STDs were identified from the regional Outpatient Database by choosing the appropriate provision codes ([Appendix Table A1](#)). Young women hospitalized for deep vein thrombosis and/or pulmonary embolism were identified from Hospital Discharge Records ([Appendix Table A8](#)). As for Covid-19 infection rates, data were freely downloaded from the National Agency for Regional Health Services official website. Finally, denominators (women aged 14–25 years living in Tuscany) were obtained from the Aggregated Population Database of Tuscany. For stratified analyses, we modified the denominator accordingly, considering each LHA separately, nationality, and age group.

### *Statistical Analyses*

To explore the effect of the intervention on the selected outcomes, we performed ITS models on Stata Software, setting the intervention time at November 2018.<sup>24-26</sup> The process of selection and validation of the ITS model is described in Table 1. The analysis was carried out at the regional level. We also investigated whether the intervention had different effects among the three LHAs of Tuscany. Finally, to explore for which groups the intervention’s effect was more marked, we repeated the same analysis by stratifying for age group and nationality. Abortion rates were also split for the type of abortion (medical or surgical).

Table 1. ITS Model for Monthly Abortion Rates per 100,000 Women Aged 14–25 Years

|  | Coefficient | P Value | 95% CI            | Stratification    |
|--|-------------|---------|-------------------|-------------------|
| A. Regional Level  |             |         |                   |                   |
| Preintervention trend  | −0.303      | .037    | −0.587 to −0.019  | Tuscany           |
| Effect of intervention on previous trend                       | −0.612      | .016    | −1.108 to −0.117  |                   |
| Postintervention trend   | −0.915      | <.001   | −1.284 to −0.546  |                   |
| Constant   | 61.555      | <.001   | 55.612 to 67.497  |                   |
| B. Subanalysis for Each LHA                                    |             |         |                   |                   |
| Effect of intervention on previous trend                       | −0.813      | .015    | −1.461 to −0.165  | North-West LHA    |
|  | −0.305      | .449    | −1.107 to 0.497   | Center LHA        |
|  | −0.931      | .029    | −1.765 to −0.097  | South-East LHA    |
| C. Subanalysis for Age Group, Nationality, and Abortion Method |             |         |                   |                   |
| Effect of intervention on previous trend                       | −0.283      | .129    | −0.651 to 0.085   | ≤18 years         |
|  | −0.88       | .034    | −1.690 to −0.070  | >18 years         |
|  | −2.306      | .008    | −3.988 to −0.624  | Non-Italian       |
|  | −0.424      | .035    | −0.816 to −0.0315 | Italian           |
|  | −0.151      | .316    | −0.449 to 0.148   | Medical abortion  |
|  | −0.499      | .024    | −0.928 to −0.069  | Surgical abortion |

The preintervention trend is the trend of monthly abortion rates observed before November 2018. The effect of the intervention on the preintervention trend represents the additional decrease that the regional intervention caused on the preintervention trend. The postintervention trend is the sum of the two previous values and represents the trend of monthly abortion rates after November 2018. The model was adjusted for monthly Covid-19 infection rates, which showed no statistical significance. Model selection and validation were performed as follows. After declaring the data set as panel, we ran a single-group interrupted time series (ITS) analysis (itsa command on Stata) using Newey–West standard errors and one lag. We checked for autocorrelation through the Cumby-Huizinga postestimation test to identify the known finite lag at which serial correlation in the time series dies out. Statistical significance was set at a *P* value <.05. CI = confidence interval, LHA = Local Health Authority. Source: Sant’Anna School of Advanced Studies

As for our first outcome (abortion rates), we performed a two-step analysis to further corroborate our findings and check for the robustness of our results. We performed on Stata Software an autoregressive integrated moving average (ARIMA) model, which has been widely adopted in the literature for ITS studies.<sup>25,27,28</sup> The ARIMA model also allowed for forecasting monthly abortion rates by October 2021 in the presence of two different scenarios based on the value assumed by the dichotomous variable “*intervention*”: (1) free contraception program maintained; or (2) free contraception program suspended. The process of identification, selection, and estimation of the ARIMA model is described in [Appendix Table A7](#).

## Results

The total eligible population — women aged 14–25 years residing in Tuscany — remained broadly stable across the study period, increasing slightly from 187,329 in 2016 to 188,807 in 2020. More detailed information on the total eligible population and the relative proportions by age group, nationality, and LHA are provided in [Appendix Table A2](#).

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“ Annual abortion rates per 1,000 women fell by 24% in Tuscany across the entire study period. However, abortion rates decreased by 9% from 2016 to 2018 (from 7.0 to 6.4) and, after the introduction of the regional program, by 17% from 2018 to 2020 (from 6.4 to 5.3).”

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## Abortion

Between 2016 and 2020, 5,977 young women living in Tuscany had an abortion. Of these, 68% were of Italian nationality, whereas 32% were not. Most of them (83%) were over 18 years old. Annual abortion rates per 1,000 women fell by 24% in Tuscany across the entire study period (Table 2). However, abortion rates decreased by 9% from 2016 to 2018 (from 7.0 to 6.4) and, after the introduction of the regional program, by 17% from 2018 to 2020 (from 6.4 to 5.3). The biggest decrease was observed among women under 18 years of age (−37%) compared with over 18 (−21%); in both age groups, the 2018–2020 decline was almost two-fold higher than the 2016–2018 decline, from −13% to −27% for women under 18 and from −7% to −15% for those over 18. Among Italian women, abortion rates diminished by 37%, whereas among non-Italian women, the 2018–2020 decline reversed the increasing trend observed in the previous years.

ITS models (Table 2 and [Appendix Figure A1](#)) confirmed the significant ( $P = .016$ ) additional decrease, relative to the preintervention trend, in monthly abortion rates by 0.61 per month after the introduction of the regional campaign.

When adjusting for the sociodemographic and hospital features available from the VTP Database ([Appendix Table A7](#)), we obtained very similar postintervention coefficients (−0.47;  $P = .033$ ).

We analyzed the effect of the intervention in each of the three LHAs separately, finding a significant decrease over time in only the South-East and North-West LHAs (−0.93 and −0.81, respectively), but not in the Center LHA (Table 1). In contrast, the effect of the public program was prominent among non-Italian women (−2.31) and women over 18 years (−0.88), although also being significant for Italian women (−0.42).

We also analyzed abortion rates by the type of abortion. We found that annual medical abortion rates per 1,000 women increased by 25% from 2016 to 2018 (from 1.6 to 2.0) and by 20% from 2018 to 2020 (from 2.0 to 2.4). On the contrary, surgical abortion rates fell by 18.5% from 2016 to 2018 (from 5.4 to 4.4), and by 34% from 2018 to 2020 (from 4.4 to 2.9). ITS analyses confirmed that the main effect was on surgical abortions (−0.50), because no statistical significance emerged for medical methods.

Finally, the ARIMA model not only confirmed that the public intervention was significantly effective ( $P < .001$ ) in reducing abortion rates over time, but also showed that the forecasted

Table 2. Annual Rates per 1,000 Residing Women Aged 14–25 Years for Abortions, Contraception Provision, Access to Free Counseling Centers, and Conception

| Variable               | Abortions  |             |             |  | Contraception Provision |            |              |  | Access to Free Counseling Centers |              |              |  | Conception  |             |             |  |
|------------------------|------------|-------------|-------------|--|-------------------------|------------|--------------|--|-----------------------------------|--------------|--------------|--|-------------|-------------|-------------|--|
|                        | 2016       | 2018        | 2020        |  | 2016                    | 2018       | 2020         |  | 2016                              | 2018         | 2020         |  | 2016        | 2018        | 2020        |  |
| Year                   |            |             |             |  |                         |            |              |  |                                   |              |              |  |             |             |             |  |
| Full Cohort            | 187,329    | 187,625     | 188,807     |  | 187,329                 | 187,625    | 188,807      |  | 187,329                           | 187,625      | 188,807      |  | 187,329     | 187,625     | 188,807     |  |
|                        | <b>7.0</b> | <b>6.4</b>  | <b>5.3</b>  |  | <b>0.2</b>              | <b>0.1</b> | <b>192.3</b> |  | <b>111.1</b>                      | <b>83.2</b>  | <b>110.5</b> |  | <b>25.3</b> | <b>21.7</b> | <b>18.0</b> |  |
| Age Group              |            |             |             |  |                         |            |              |  |                                   |              |              |  |             |             |             |  |
| ≤18 years              | 76,393     | 77,863      | 79,075      |  | 76,393                  | 77,863     | 79,075       |  | 76,393                            | 77,863       | 79,075       |  | 76,393      | 77,863      | 79,075      |  |
|                        | <b>3.0</b> | <b>2.6</b>  | <b>1.9</b>  |  | <b>0.2</b>              | <b>0.0</b> | <b>122.9</b> |  | <b>100.4</b>                      | <b>76.5</b>  | <b>89.4</b>  |  | <b>2.6</b>  | <b>4.4</b>  | <b>2.9</b>  |  |
| >18 years              | 110,936    | 109,762     | 109,732     |  | 110,936                 | 109,762    | 109,732      |  | 110,936                           | 109,762      | 109,732      |  | 110,936     | 109,762     | 109,732     |  |
|                        | <b>9.8</b> | <b>9.1</b>  | <b>7.7</b>  |  | <b>0.2</b>              | <b>0.1</b> | <b>242.4</b> |  | <b>118.4</b>                      | <b>87.9</b>  | <b>125.7</b> |  | <b>41.0</b> | <b>33.9</b> | <b>29.0</b> |  |
| Nationality            |            |             |             |  |                         |            |              |  |                                   |              |              |  |             |             |             |  |
| Non-Italian            | 26,591     | 24,097      | 24,150      |  | 26,591                  | 24,097     | 24,150       |  | 26,591                            | 24,097       | 24,150       |  | 26,591      | 24,097      | 24,150      |  |
|                        | <b>8.8</b> | <b>15.5</b> | <b>12.4</b> |  | <b>0.0</b>              | <b>0.0</b> | <b>135.3</b> |  | <b>44.8</b>                       | <b>77.5</b>  | <b>101.1</b> |  | <b>42.1</b> | <b>81.8</b> | <b>65.7</b> |  |
| Italian                | 160,738    | 163,528     | 164,657     |  | 160,738                 | 163,528    | 164,657      |  | 160,738                           | 163,528      | 164,657      |  | 160,738     | 163,528     | 164,657     |  |
|                        | <b>6.7</b> | <b>5.1</b>  | <b>4.2</b>  |  | <b>0.2</b>              | <b>0.1</b> | <b>200.7</b> |  | <b>122.0</b>                      | <b>84.0</b>  | <b>111.9</b> |  | <b>22.6</b> | <b>12.8</b> | <b>11.0</b> |  |
| Local Health Authority |            |             |             |  |                         |            |              |  |                                   |              |              |  |             |             |             |  |
| North-West             | 62,543     | 62,304      | 62,371      |  | 62,543                  | 62,304     | 62,371       |  | 62,543                            | 62,304       | 62,371       |  | 62,543      | 62,304      | 62,371      |  |
|                        | <b>6.9</b> | <b>6.4</b>  | <b>5.5</b>  |  | <b>0.2</b>              | <b>0.2</b> | <b>176.1</b> |  | <b>167.6</b>                      | <b>102.3</b> | <b>118.5</b> |  | <b>23.7</b> | <b>21.4</b> | <b>17.9</b> |  |
| Center                 | 82,934     | 83,865      | 84,883      |  | 82,934                  | 83,865     | 84,883       |  | 82,934                            | 83,865       | 84,883       |  | 82,934      | 83,865      | 84,883      |  |
|                        | <b>7.5</b> | <b>6.8</b>  | <b>5.6</b>  |  | <b>0.2</b>              | <b>0.0</b> | <b>170.7</b> |  | <b>82.6</b>                       | <b>76.3</b>  | <b>95.7</b>  |  | <b>26.6</b> | <b>21.5</b> | <b>18.1</b> |  |
| South-East             | 41,852     | 41,456      | 41,553      |  | 41,852                  | 41,456     | 41,553       |  | 41,852                            | 41,456       | 41,553       |  | 41,852      | 41,456      | 41,553      |  |
|                        | <b>6.1</b> | <b>5.7</b>  | <b>4.2</b>  |  | <b>0.0</b>              | <b>0.0</b> | <b>260.9</b> |  | <b>82.9</b>                       | <b>68.6</b>  | <b>128.7</b> |  | <b>25.4</b> | <b>22.3</b> | <b>18.0</b> |  |

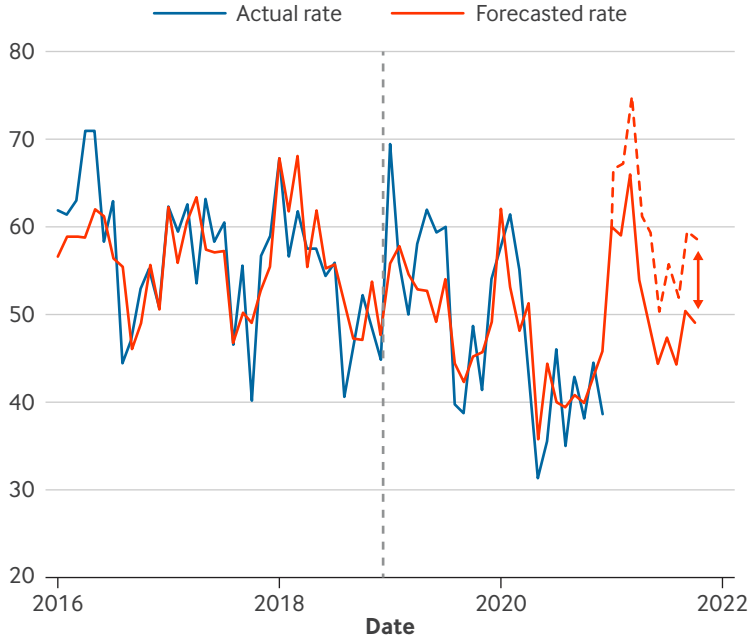
Stratified by age, nationality, and Local Health Authorities at three time points: study baseline (2016), introduction of free contraception program (2018), and end of study (2020). Denominators are given in italics and rates per 1,000 women in boldface. Outpatient services utilization rates for STDs are shown in Appendix Table A3. Source: Sant'Anna School of Advanced Studies



FIGURE 1

## Forecasted Monthly Abortion Rates by October 2021 Based on the Continuation or Suspension of the Regional Contraception Program

Abortion rates are forecasted in two different scenarios: (1) 49.1 per 100,000 women with the free contraception program maintained (solid line); and (2) 58.6 per 100,000 women with the free contraception program suspended (dashed line). The grey line indicates the introduction of the free contraception program in November 2018. Covid-19 infection rates from January to October 2021 were freely downloaded from the National Agency for Regional Health Services (AGENAS) official website. See Appendix Table A7 for more detailed information about the autoregressive integrated moving average (ARIMA) model.



Source: Sant'Anna School of Advanced Studies  
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abortion rates by October 2021 would reach higher values (58.6) if the free contraception program was suspended rather than maintained (49.1) ([Appendix Table A7](#)). Figure 1 visually confirms this evidence, corroborating our previous findings.

### Contraception Provision

The annual provision of hormonal contraceptives in outpatient and counseling centers among young Tuscan women was almost completely absent before 2018 (Table 2). At that point, contraception began to be provided without charge, resulting in a notable increase. The increase was more marked among Italian women, women over 18, and women in the South-East LHA.

**Table 3. Contraception Provision in Outpatient Settings**

|  | Coefficient | P Value | 95% CI             |                |
|--|-------------|---------|--------------------|----------------|
| A. Regional Level                            |             |         |                    |                |
| Preintervention trend                        | -0.032      | .031    | -0.06 to -0.003    | Tuscany        |
| Effect of intervention on previous trend     | 87.598      | <.001   | 77.767 to 97.428   |                |
| Postintervention trend                       | 87.566      | <.001   | 77.735 to 97.397   |                |
| Constant                                     | 1.715       | <.001   | 1.056 to 2.374     |                |
| B. Subanalysis for Each LHA                  |             |         |                    |                |
| Effect of intervention on previous trend     | 74.536      | <.001   | 60.371 to 88.701   | North-West LHA |
|  | 78.927      | <.001   | 70.898 to 86.956   | Center LHA     |
|  | 124.922     | <.001   | 107.749 to 142.095 | South-East LHA |
| C. Subanalysis for Age Group and Nationality |             |         |                    |                |
| Effect of intervention on previous trend     | 56.000      | <.001   | 48.085 to 63.914   | ≤18 years      |
|  | 110.350     | <.001   | 98.178 to 122.523  | >18 years      |
|  | 58.911      | <.001   | 52.510 to 65.312   | Non-Italian    |
|  | 91.822      | <.001   | 80.851 to 102.794  | Italian        |

The preintervention trend is the trend of monthly abortion rates observed before November 2018. The effect of the intervention on the preintervention trend represents the additional decrease that the regional intervention caused on the preintervention trend. The postintervention trend is the sum of the two previous values and represents the trend of monthly abortion rates after November 2018. The model was adjusted for monthly Covid-19 infection rates, which showed no statistical significance. The interrupted time series model was applied for monthly contraception provision rates per 100,000 residing women aged 14–25 years. Hormonal and emergency methods are included, whereas barrier methods are excluded. CI = confidence interval, LHA = Local Health Authority. Source: Sant’Anna School of Advanced Studies

“*Conception rates in Tuscany declined by 14% from 2016 to 2018 and by 17% from 2018 to 2020.*”

ITS models (Table 3 and [Appendix Figure A1](#)) showed that monthly contraception provision rates were declining by 0.032 before the intervention ( $P = .031$ ). Then, the effect of the intervention was so evident that the increase over time reached very high values (+87.6;  $P < .001$ ), as confirmed by the postintervention trend. This significant effect persisted when stratifying for age group, nationality, and LHAs and was again more pronounced for Italian women, women over 18 years of age, and women in the South-East LHA.

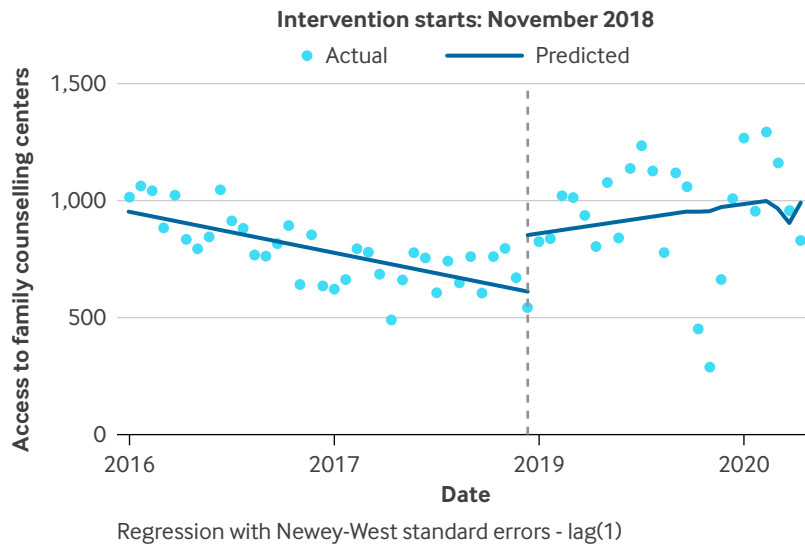
### *Access to Counseling Centers*

Annual access rates to family counseling centers in the contraception area among young women had been declining from 2016 to 2018 in all groups except non-Italian women (Table 2). After the introduction of the program, access rates started to rise, almost getting back to 2016 values in most groups. Such an increase was again more evident among Italian women, women over 18 years, and those in the South-East LHA.

FIGURE 2

## Effect of the Intervention on Access Rates to Family Counseling Centers

This graph shows the effect of the intervention on access rates to family counseling centers per 100,000 women at the regional level.



Source: Sant'Anna School of Advanced Studies

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ITS models (Figure 2 and [Appendix Table A4](#)) showed that, despite the negative trend ( $-9.75$ ;  $P < .001$ ) before the intervention, the regional resolution was effective in increasing the monthly rates over time by  $16.75$  ( $P = .046$ ). After stratification, the positive effect remained statistically significant ( $P = .003$ ) in the North-West LHA ( $+28.53$ ) and again was more marked among Italian women and women older than 18 years of age.

### Conception

Conception rates in Tuscany declined by 14% from 2016 to 2018 and by 17% from 2018 to 2020 (Table 2). A similar trend was observed in each LHA and among Italian women and women over 18 years of age. Conception rates had been increasing until 2018 among non-Italian women and women under 18, but after 2018, they also started to decrease in these two groups, although they did not return to 2016 rates.

ITS models ([Appendix Table A5](#)) showed no significant effect of the intervention over time in any group except women younger than 18, for which the intervention was effective in reversing the preintervention trend and reducing monthly conception rates by  $0.84$  ( $P = .004$ ), thus supporting the evidence that the regional resolution reduced teenage conception. Contrary to

expectations, we observed a significant ( $P = .009$ ) additional increase in monthly conception rates by 1.20 in the Center LHA, a surprising result that may need further study.

### *Outpatient Services Utilization for STDs*

Annual outpatient service utilization rates for STDs are shown in [Appendix Table A3](#). Rates for CT decreased from 2016 to 2018 and then remained stable until 2020. Rates for TP increased during the study period. Rates for HIV slightly decreased from 2016 to 2018 and then increased slightly between 2018 and 2020 until they were almost back to 2016 values. Rates for HPV increased in all groups except in the North-West and South-East LHAs, where the increasing 2016–2018 trend was reversed after 2018. Rates for NG and HSV were stable or slightly increasing before 2018 and decreased afterwards.

ITS models ([Appendix Table A6](#) and [Appendix Figure A2](#)) revealed some partial but positive and significant effects of the intervention. Indeed, the intervention was effective in reducing regional rates for HSV and NG by 0.78 and 0.15, respectively ( $P = .003$ ). After stratification, the statistical significance for NG was lost in the Center LHA but maintained in the other two LHAs, whereas the effect on HSV lost its statistical significance in all LHAs even though the  $P$  value remained at or below .07. Surprisingly, a very significant effect for HPV emerged in the North-West and South-East LHAs. After stratification for age and nationality, the effect on NG, HPV, and HSV became statistically significant in all groups, showing as more pronounced among women over 18 and non-Italian women. However, the effect on HPV was higher among Italians.

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“ *The provision of all types of contraceptives (excluding barrier methods) in outpatient and counseling centers increased notably after the public intervention.* ”

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Interestingly, a significant effect also emerged among women under 18 years of age for the other three STDs considered, for which no statistical significance had been found in previous analyses ([Appendix Figure A3](#)). Particularly, focusing on women under 18, the regional program was effective in reducing outpatient services utilization for CT ( $-0.10$ ;  $P = .072$ ), TP ( $-1.15$ ;  $P = .004$ ), and HIV ( $-1.24$ ;  $P = .011$ ).

### *Hospitalizations for Deep Vein Thrombosis and Pulmonary Embolism*

We checked for the safety of the regional program at the population level by computing hospitalization rates for deep vein thrombosis and pulmonary embolism among young residing women, regardless of contraceptive use. Because of the low number of observations, these rates were only computed annually per 1,000 women. As shown in [Appendix Table A8](#), annual regional rates were decreasing before 2018, but afterwards, they started to increase, reaching values similar to 2016 rates. Despite the increase in annual rates, the absolute number of annual hospitalizations was very low overall (from six to 14 per year). Moreover, annual rates among

women under 25 were found to be at least twofold lower than those of the general population of fertile women not assuming contraceptive use (0.20 per 1,000).<sup>29</sup>

A similar trend was observed in each LHA. However, the increase was less pronounced in the South-East LHA, where, on the contrary, the increase in contraception provision was more evident. Also, 2020 data showed a reversal of the previous rising trend observed in 2019 in the South-East LHA. Therefore, even without having information about the specific types of contraceptives dispensed in each LHA, we argue that, overall, the increase in contraception provision did not increase side effects. However, care should be taken in prescribing hormonal contraceptives appropriately, following international and national guidelines.

## Discussion

### *Main Findings*

We employed ITS methodologies to demonstrate the effect of a regional resolution issued in Tuscany in November 2018 ensuring all contraceptives free of charge to young women aged 14–25 years and residing in Tuscany. We found that the provision of all types of contraceptives (excluding barrier methods) in outpatient and counseling centers increased notably after the public intervention. At the same time, hospitalization rates for deep vein thrombosis and pulmonary embolism increased, but in absolute terms, the increase was extremely small.

Because free contraception was provided after medical evaluation at free counseling centers, we expected an increase in the access to these centers. Indeed, ITS models showed that the regional intervention did promote higher access to counseling centers in the contraception area for young women. Abortion rates among young women entitled to free contraception declined significantly after the intervention. The main effect was on surgical abortions, with no statistical difference for medical ones. This evidence did not affect the success of the campaign, because in Tuscany, most abortions are performed surgically. Forecasted abortion rates confirmed that higher abortion rates would result by October 2021 if the public program was stopped.

Compared with the other two LHAs, the effect was more evident in the South-East LHA, where contraception provision and counseling centers utilization were at the highest level, suggesting a more effective application of the regional resolution. Overall, the impact of the regional program was more marked for Italian women and women over 18, for whom contraception and counseling services might have been more accessible. However, the effect on contraception uptake and access to counseling services was also significant among non-Italian women, although lower. Indeed, the intervention was very effective in reducing abortions among non-Italian women, as shown by the higher coefficient ( $-2.306$  for non-Italians and  $-0.424$  for Italians).

Most (97.6%) of the non-Italian women in our cohort came from high-migration-pressure countries,<sup>30</sup> such as countries in Central and Eastern Europe (including those belonging to the European Union) and Malta and countries in Africa, Asia (excluding South Korea, Israel, and Japan), Central and South America, and Oceania (except Australia and New Zealand). Such ethnic minorities are known to be prone to repeat abortions, as reported by the Italian Ministry

of Health’s most recent report on induced abortion.<sup>1,31</sup> The causes of this phenomenon are many and are not fully understood. In general, non-Italian women who reside legally in Italy are entitled to free access to all public health services. Therefore, we should assume that the greater tendency for repeat abortion by non-Italian women is due to a combination of cultural, social, occupational, religious, and economic causes, as suggested previously by Farina and Ortensi.<sup>32</sup>

Indeed, using the dichotomous variable “previous induced abortion” from the VTP Database, we also observed that in our cohort, the proportion of non-Italian women having a repeat abortion (39.1%) was higher than among Italian women (29.2%). This difference could explain why, despite the higher increase in contraception uptake and access to counseling centers among Italian women, the effect of the regional campaign in reducing abortion rates was greater among non-Italian women. We believe that in Italy, there is still an unmet need for adequate information, care, and support regarding contraception and emergency contraception, which should be responded to in order to prevent recurrent recourse to abortion in the population groups at greater risk, such as non-Italian women. Further research is needed to identify groups at higher risk for repeat abortions and to investigate the determinants of this phenomenon, with the aim of developing specific goals to improve reproductive health in these population groups.

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“ *Abortion rates among young women entitled to free contraception declined significantly after the intervention.* ”

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As for conception rates, a positive effect was detected only among women under 18, meeting a specific target of the regional resolution (reducing undesired teenage conceptions), whereas no effect was detected among women over 18. Because conceptions account for both births and abortions, we think that the regional resolution was *also* effective in reducing unintended pregnancies among women under 18, whereas women over 18 might have been more likely to have intended pregnancies.

Previous studies analyzed the effectiveness of public interventions aiming at enhancing contraception uptake. For instance, Gyllenberg et al.<sup>13,14</sup> proved that a public program enacted in the Finnish city of Vantaa ensuring long-acting reversible contraceptive methods free of charge to all residing women was effective in lowering abortion rates and enhancing contraception uptake. Also, Ma et al.<sup>15</sup> showed that a target-based pay-for-performance scheme implemented in 2010 in Britain for primary care physicians to offer advice about long-acting reversible contraceptive methods, which are free of charge for British women, promoted contraception uptake and reduced abortions.

However, these studies focused solely on contraception uptake and abortions to evaluate the effectiveness of public interventions. We considered several further outcomes on which the regional intervention could have direct and indirect effects, such as access rates to counseling centers, conception rates, and STDs. For instance, we found that the free contraception program of Tuscany was effective in increasing access rates to counseling centers — where free contraception was provided — reversing the previous downward trend. As a result, the entire care

pathway was empowered. This evidence was in line with the targets of the last analysis carried out in 2019 by the Italian National Institute of Health, according to which counseling services should be implemented throughout the Italian territory to better address adolescents' needs and improve territorial activities to promote psychophysical and reproductive health among high school students.<sup>7,33</sup> This study proved that Tuscany reached this goal.

The increased access to counseling centers and the general enhancement of the care pathway might have indirectly fostered a significant reduction in outpatient services utilization for STDs among women entitled to free contraception. One may argue that a greater provision of hormonal contraceptives could enhance the spread of STDs, as suggested previously.<sup>34</sup> However, the free contraception program of Tuscany also included barrier methods and encouraged women to visit public counseling centers, where they saw doctors and talked with them about sexuality, prevention, and sexual health. This information might have instilled a deeper awareness of the importance of sexual prevention in young women, leading to a reduction in STD diffusion. This suggestion reinforces the role and value of counseling centers but needs more research to be confirmed.

### *Strength and Limitations*

The main limitation is the nongeneralizability of results, because the study was carried out in a single Italian region. However, our findings may support other regions in promoting similar public programs. Tuscany is among the regions with the highest number of family counseling centers and the lowest rate of conscientious objectors to providing abortion services.<sup>9,35</sup> Therefore, when implementing similar programs, regions should also consider these important determinants, which may trigger or hinder the effects of a free contraceptive campaign within their territories.

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*We found that the program was effective in increasing access rates to counseling centers, where free contraception was provided, reversing the previous downward trend. As a result, the entire care pathway was empowered.”*

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A second limitation is related to data availability, because we had no information about marital status, socioeconomic status, ethnicity, prior births or abortions, in-/out-migration, or other sociodemographic and regional-level variables. However, to smooth the confounding effect of financial and other sociodemographic conditions in the analysis of the first group (young women), we controlled for several variables at the population and hospital levels and performed several subanalyses by stratifying for LHA, nationality, and age.

Access to voluntary abortion is a major issue in Italy, because very high conscientious objection rates have been detected among health care providers in some regions (mainly in the South).<sup>36</sup> However, we did not adjust our models for the rate of objection. Indeed, the last reports by the Italian Ministry of Health revealed that objection rates in Tuscany decreased from 60% to 55% in the period 2016–2019<sup>35</sup> and are below the national average (67% in 2019). Lower abortion

rates in general may be due to limited access to this kind of service instead of appropriate use of contraceptives. However, because the rate of conscientious objection is low in Tuscany and has decreased in recent years, access to abortion should be better relative to other regions, so we feel confident that the reduction in abortion rates reflects improved availability of contraception rather than lack of access to abortion.

Despite these limitations, this is the first study to explore the effectiveness of a free contraception public program for young women by evaluating its impact on several different outcomes. Its strength is related to the use of high-quality regional administrative data, such as the VTP Database comprising all women receiving abortion regardless of the clinical setting. Data quality is routinely checked by the Regional Health Information System Office of Tuscany and, therefore, is well validated and reliable. In addition, administrative data are easily accessible and allow gathering of real-world information about the entire population of interest.<sup>37</sup> Finally, our data set had no interruptions, thus avoiding the chance of concomitant events invalidating the ITS analysis results.

### *Implications*

The findings of this study provide both practitioners and academics with very useful insights.

First, this study gave evidence that the free contraception program issued by Tuscany in November 2018 was successful at least for young women, thus supporting the continuation of the regional program in Tuscany. It also provided a concrete example of the general principle that it is possible to reduce abortion rates by promoting contraception, and this example could serve as a model for other Italian regions or other countries implementing free contraception programs that pursue the same principle, although they may differ in details depending on local needs.

Second, the positive effects of this intervention were found along the entire counseling care pathway: the increased access to the counseling centers for obtaining free contraceptives led to reductions in abortion rates, outpatient services utilization for STDs (used as a proxy for reduction in the incidence of STDs), and teenage conception, which is a great social problem all around the world.<sup>38</sup> Furthermore, although previous articles based on descriptive statistics and expert opinions have noted the potential difficulties in accessing abortion services during the Covid-19 pandemic in Italy,<sup>39-41</sup> this study found that Covid-19 infection rates did not significantly affect any of the five outcomes in Tuscany, suggesting regional resilience to the pandemic. These results will be shared with the Tuscany Region Health Authority to provide further evidence for regional policy accountability and value-based decision-making.

Our results raise questions that can be explored in future studies. First, the variable effect detected across the LHAs suggests that the region should monitor the implementation of the public program using specific indicators beyond the general performance indicators on abortion rates available in the Performance Evaluation System.<sup>11</sup> In agreement with the Regional Health Authority, we have created, starting in 2021, a new performance indicator, “Rate of free contraception provision to young residents,” to monitor the results of the regional campaign. The indicator was calculated retrospectively from 2019 to analyze the trend.



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“ *Positive effects of this intervention were found along the entire counseling care pathway: the increased access to the counseling centers for obtaining free contraceptives led to reductions in abortion rates, outpatient services utilization for STDs, and teenage conception.*”

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Second, the problems in accessing abortion services suggested in previous publications may be more pronounced in those territories where counseling centers are low in number or conscientious objection rates extremely high. The Italian Ministry of Health reports showed wide interregional variations in the rate of objection in 2019 (from 23% to more than 85%).<sup>42</sup> A comparative analysis between the Tuscany regional campaign and similar campaigns in other regions, even if different in the way they are implemented, might allow for exploration of the mediating and moderating effect of certain determinants, such as the number and quality of counseling centers and the objection rate. Furthermore, because the effects of the same regional resolution were different across our three LHAs, it would be interesting to understand the determinants of the successful implementation of the regional program in each specific LHA through qualitative and comparative analysis based on case studies.

In conclusion, we proved that the free contraception public program enacted by Tuscany in November 2018 was effective in reducing abortion rates among young women aged 14–25 years by promoting access to counseling and contraception services. The wider access to counseling centers and the general empowerment of counseling care pathways might have enhanced sexual health and pregnancy prevention among young women, thus limiting the diffusion of some STDs. Our results support the maintenance of the free contraception program within Tuscany and provide further evidence for regional policy accountability and value-based decision-making. In addition, policymakers and managers from other regions and countries should consider these findings to promote similar campaigns within their territories.

### *Ethics Approval and Data Sharing*

The quality of the administrative health data used in this study is routinely checked by the Regional Health Information System Office of Tuscany, which also ensures data pseudo-anonymization by assigning to each patient an encrypted unique identifier. The study was carried out in compliance with the Italian law on privacy 101/2018 (aligned with the European GDPR 2016/679), and data were employed at the aggregated level. Record linkage was performed by date (month and year) and not at the individual level. Therefore, patient consent and approval by an ethics committee were not required.<sup>23</sup> For the same reasons, aggregated data and statistical procedures that support the findings of this study are available upon reasonable request. However, individual-level data are not available.

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## Appendix

[Appendix A1, Tables A1-8, and Figures A1-3](#)

*Disclosures: Amerigo Ferrari, Manila Bonciani, Ilaria Corazza, Costanza Tortù, Tommaso Simoncini, and Milena Vainieri have nothing to disclose.*

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