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# Diagnosis and Treatment of Diminished Ovarian Reserve in ART Cycles of Women Up to Age 40 Years: The Role of Insurance Mandates

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## Summary

**Objective—**To explore correlates of diminished ovarian reserve (DOR) and predictors of ART treatment outcome in DOR cycles using the SART-CORS database. We hypothesized that state insurance coverage for ART is associated with the prevalence of DOR diagnosis in ART cycles and with treatment outcomes in DOR cycles.

**Design—**Cross sectional study using ART cycles between 2004–2007.

**Setting—**United States ART registry data.

**Patients—**182,779 fresh, non-donor, initial ART cycles in women up to age 40.

**Interventions—**None.

**Main Outcome Measures—**Prevalence of DOR and elevated FSH, odds ratio of DOR and elevated FSH in ART mandated vs. non-mandated states, live birth rates.

**Results—**Compared to cycles performed in states with mandated ART coverage, cycles in states with no ART mandate were more likely to have DOR (AOR 1.43 95% CI 1.37–1.5, p<0.0001) or elevated FSH (AOR 1.69 95% CI 1.56–1.85, p<0.0001) as the sole reason for treatment. A relationship between lack of mandated ART coverage and increased live birth rates in some, but not all DOR cycles.

**Conclusions—**A significant association was observed between lack of mandated insurance for ART and the proportion of cycles treating DOR or elevated FSH. The presence or absence of state



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mandated ART coverage could impact access to care and the mix of patients that pursue and initiate ART cycles. Additional studies are needed that consider the coalescence of insurance mandates, patient and provider factors, and state level variables on the odds of specific infertility diagnoses and treatment prognosis.

### Keywords

Diminished Ovarian Reserve; Elevated FSH; Infertility Insurance Mandates; SART-CORS Database; Assisted Reproductive Technologies; ART

## Introduction

Other than advancing age, little is known about the demographic correlates of and risks factors for diminished ovarian reserve (DOR). DOR is a term that has been used to characterize women at risk for poor performance with assisted reproductive technologies (ART) due to an egg factor (1–4). A specific challenge to uncovering clinical factors related to DOR occurs when performing studies at the individual clinic level which often leaves limited numbers of patients for study to test inferences with sufficient statistical power. The availability of large sets of ART cycle data tracking many women with DOR such as from the national registry of ART cycles in the US collected by the Society for Assisted Reproductive Technology (SART) circumvents challenges of limited sample size permitting a more powerful assessment of relevant correlates of DOR in women pursuing ART.

Using registry data also allows the assessment of putative DOR risk factors that could not be investigated unless national data sets were utilized. There is a growing literature addressing the impact of insurance mandates on the mix of patients pursuing ART and on treatment outcomes (5–8). It is well known that mandates increase utilization of infertility treatments and that clinical pregnancy rates and multiple pregnancy rates tend to be lower in mandated states compared to non-mandated states (6–8). Recently, it has been suggested that differential treatment outcomes in mandated states may be influenced by the utilization of treatments in women with poor prognosis who seek treatment despite a diminished odds of pregnancy (5, 6). However, in the literature that has explored the impact of mandates on infertility and the outcomes of its treatment, none to date have specifically compared prevalence of DOR in ART cycles as a function of insurance coverage. While mandates could increase access to care in poor prognosis patients, a contrasting argument can be made that lack of coverage may also enhance the proportion of poor prognosis patients in non-mandated states. It is possible for instance, that in states with limited coverage, significant delays occur before treatment can be sought which might increase the mix of patients with poor prognostic indicators such as DOR. The primary aim of this investigation was to explore clinical correlates of DOR diagnosis in a national registry of ART cycles, using the SART-CORS database. Specifically, we hypothesized that state insurance coverage for ART is associated with the prevalence of DOR diagnosis and with treatment outcomes in DOR cycles. It is possible that insurance is a proxy for access to care at the state level as well as for demographic factors that are associated with DOR.

## Methods

### Data Source and Outcome Measures

This study was reviewed by the Office of Regulatory Affairs at the University of Pennsylvania Medical Center and allowed exemption from IRB approval. The data source for the study was the SART-CORS database, a registry that contains comprehensive data collected and verified by the American Society for Reproductive Medicine (ASRM)/Society for Assisted Reproductive Technology (SART) and reported to the Centers for Disease

Control and Prevention in compliance with the Fertility Clinic Success Rate and Certification Act of 1992. Greater than 90% of all clinics providing ART in the United States are compliant with the mandate to report; all data is submitted using a standardized database.

The data set for this investigation included de-identified fresh non-donor ART cycles from a four-year period performed from 2004 to 2007. The data analysis further focused on cycles (the unit of analysis) among women with no prior ART, because use of these cycles eliminated the likelihood of repeated cycle bias introduced when looking at all cycles performed in a given period, some of which represent multiple cycles per woman.

Diagnosis of DOR was examined in several ways. First, the data set was limited to cycles in women up to age 40 in order to focus the investigation on DOR in women who derived the most benefit from ART and in whom age-related selective pressures toward use of donor oocytes were lowest. Diagnostic data submitted to SART-CORS can fulfill a single category or multiple categories for a given cycle. DOR, for instance, can be the sole reason for a couple pursuing ART (DOR only) or it can be combined with other female and/or male infertility factors (DOR combined). In univariate analyses of correlates of DOR, we chose to consider all occurrences of DOR (whether or not combined with other diagnoses) and DOR individually. In multivariable logistic regression models, DOR as the sole infertility diagnosis was used as the outcome variable.

Due to the assumption of heterogeneity in the diagnosis of DOR collected from multiple clinics, two additional outcome categories were derived focusing on FSH elevation as the primary indicator of DOR. Early follicular FSH elevation was derived from the ‘Patient Maximum FSH Level SART’ field along with an assessment of the distribution of FSH values in the group. The range that was characterized as abnormal represented the 90–99% of values (extreme outliers were excluded) in women up to age 40 and corresponded to FSH values of 11IU/L-21 IU/L. Elevated FSH cycles were further distinguished as those excluding additional infertility diagnoses (Elevated FSH only). Comparable analysis was also performed in a subgroup of cycles in which women were 37 years old or less to evaluate risk factors and outcomes in young women with DOR. The range of abnormal FSH values representing the 90–99% of values was 11 IU/L-20 IU/L.

Control cycles were those with SART infertility diagnoses that did not include DOR. When elevated FSH was used to characterize DOR, those cycles with FSH from the ‘Patient Maximum FSH Level’ SART field below the range designated as elevated were categorized as normal FSH cycles. From the cycles characterized as normal FSH cycles we excluded those in which there was a concurrent diagnosis of DOR.

The primary ART treatment outcome measured was live birth per cycle initiated. Legislation regulating insurance coverage was characterized by the following categories:

- No insurance mandate for ART (No ART Mandate)
- Mandate for ART coverage (ART Mandate)

Data verifying state level mandate status during the years 2004–2007 was obtained from ASRM and Resolve, an advocacy group for individuals with infertility. Eight states fell into the ART mandate category (Arkansas, Connecticut, Hawaii, Illinois, Maryland, Massachusetts, New Jersey, Rhode Island), based on legislation mandating coverage of at least one cycle of IVF. The remaining 42 states were categorized as having no mandate for ART coverage.

Additional demographic and treatment variables available from SART-CORS were captured to perform univariate analysis across strata of DOR or insurance coverage.

### Statistical Methods

Associations between categorical variables were tested using the $X^2$ test. Comparisons of continuous variables between groups were made using the Wilcoxon Rank Sum and Kruskal Wallis tests as appropriate.

Logistic regression was used to model DOR outcomes while controlling for multiple confounders. Separate models were estimated for the outcomes DOR Only and Elevated FSH Only. Additional models were generated to evaluate the impact of specific variables, risk factors and insurance mandates on live birth rates in cycles with a DOR diagnosis. Models were created with and without race/ethnicity covariates to account for the degree of missing data points in the race variable (36% of cycles with missing data).

Due to the large number of observations and comparisons in the data set, the stringency of statistical tests was adjusted to account for possible significant associations with limited clinical significance. Statistical tests were therefore set at significance level of $p<0.0001$. Tests with $0.0001<=p<0.001$ were deemed borderline significant. Tests with a p greater than or equal to the 0.001 cutoff were evaluated individually for clinical significance.

All statistical tests were performed using STATA 10 software (College Station, Texas).

## Results

### Demographic Variables and Insurance Coverage in Cycles with and without DOR

A total of 182,779 fresh, non-donor, initial ART cycles were investigated. Compared to control cycles, those with a DOR diagnosis (DOR or Elevated FSH) involved women who were significantly older, had higher maximum early follicular FSH levels, and were less likely to be nulligravid (Table 1). In general, the proportion of Black and Latina patients was greater in control cycles than in DOR cycles. Conversely, the proportion of Asian patients was lower in control cycles than in DOR cycles.

Overall, initial ART cycles that occurred in states without ART coverage were more likely to be associated with a DOR diagnosis than were cycles conducted in states that offered ART coverage (Table 2). The odds that a cycle was associated with DOR at all when performed in a state lacking mandated ART coverage was 41 % higher (OR 1.41, 95% CI 1.36–1.45, $p<0.0001$) than when performed in state in which comprehensive ART coverage was mandated. Similarly, the odds of DOR as a sole infertility diagnosis was 30% higher in states lacking comprehensive ART coverage (OR 1.3, 95% CI 1.24–1.36, $p<0.0001$) than in states in which it was mandated. The associations between DOR and lack of ART coverage were maintained when elevated FSH was used as the DOR outcome (Table 2). Similar findings were observed for the association between lack of mandated ART coverage and DOR in cycles performed in women up to age 37 (Table 2).

### Multivariable Logistic Regression for Risk Factors for DOR Diagnosis

Multivariable logistic regression was performed for the outcomes DOR only, and elevated FSH only. Models for each outcome were fit that controlled for maternal age at time of treatment, year that the treatment was performed, gravidity, and insurance coverage. Compared to initial ART cycles performed in states with mandated ART coverage, cycles performed in states without coverage were 43% more likely to carry DOR as a sole infertility diagnosis (AOR 1.43 95% CI 1.37–1.5, $p<0.0001$) (Table 3). Likewise, cycles

classified as having elevated FSH as a sole infertility diagnosis were more likely to be performed in states with no mandate for ART coverage (AOR 1.69 95% CI 1.56–1.85, p<0.0001) than in ART-mandated states (Table 3). In cycles performed in women age 37 or less, similar associations between lack of ART insurance mandates and adjusted odds of DOR and Elevated FSH as the sole infertility diagnosis were observed (**Supplemental Table 1**).

While race and ethnicity were associated with DOR, the significance of these associations varied across the models (**Supplemental Tables 2 and 3**). Relative to White women, cycles in Asian women had higher odds of DOR only diagnosis but not of Elevated FSH only. Cycles in Black women were significantly less likely to be diagnosed with DOR only or Elevated FSH only compared to cycles in White women. Cycles in Latina women demonstrated lower odds of DOR only diagnosis than cycles in White women; borderline associations of Latina ethnicity and lower odds of Elevated FSH only diagnosis were observed. Adding variables for race and ethnicity to the DOR models did not eliminate the relationship between insurance status and DOR or Elevated FSH.

A significant secular trend of increased odds of DOR diagnosis was observed, inclusive of the years 2004 to 2007 (Table 3 and **Supplemental Tables 1–3**). The adjusted odds ratio of DOR only (in cycles up to age 40 years) as a function of time (per year studied) was 1.11, which translates to a 23% higher odds of DOR in 2005 compared to 2004, 37% higher odds of DOR in 2006 compared to 2004, and 52% higher odds of DOR in 2007 compared to 2004. Comparable trends in each year studied were observed in cycles in which Elevated FSH was the sole infertility diagnosis and in cycles performed in women 37 years old or less.

### Treatment Outcomes as a Function of DOR Diagnosis and Insurance Coverage

In univariate analysis, live birth rates were significantly lower in cycles associated with a diagnosis of DOR than in cycles without this diagnosis (**Supplemental Table 4**). With the exception of Elevated FSH only cycles, live births in DOR cycles occurred less frequently in states with comprehensive ART insurance coverage than in states without it. Numbers of embryos transferred per initiated DOR cycle were lower in states with comprehensive coverage than in states with partial coverage or no mandated coverage.

Multivariable logistic regression was used to model the odds of live birth in initial ART cycles with DOR. In models that focused on live births in DOR only cycles for women up to age 40, an association between lack of ART mandates and increased odds of live birth per cycle initiated was found was observed (AOR 1.27 95% CI 1.11–1.44). In the models that explored live birth in Elevated FSH only, no associations between insurance status and live birth were observed (Table 4). In DOR or Elevated FSH cycles performed in women age 37 or less, there was no significant association between mandated ART coverage and live birth (**Supplemental Table 5**).

Adjusting for race in models for treatment outcomes did not significantly alter the associations described (**Supplemental Tables 6 and 7**).

## Discussion

A significant association between lack of state mandated ART coverage and prevalence of DOR in cycles of ART performed in patients for the first time was observed in this investigation, a relationship not previously described in the literature addressing the impact of ART coverage on treatments. The relationship between limited insurance coverage and DOR was independent of the influence of age, gravidity, race/ethnicity and year in which

the cycle was performed. It is possible that DOR is diagnosed differentially across clinics, states and regions and that this drives in part, the results noted in this study. DOR could be less readily detected in mandated states if insurance companies require the use of less sensitive tests of ovarian reserve that have been traditionally used (day 3 FSH) rather than more sensitive and recently demonstrated ones such as Anti-Mullerian Hormone (AMH) and/or antral follicle count (AFC). Data supporting this assumption are not available from our analysis and would require further study. However, a review of several insurance policies demonstrates required DOR testing with either day 3 FSH measurement or the clomiphene citrate challenge testing (9–11) and describes AMH use for this purpose as experimental (9).

Differential patient selection for ART in states with mandated coverage for cycles could generate a population of patients with a distinct pattern of diagnoses and treatment prognoses compared to states without coverage. Patients who receive treatment in states with comprehensive coverage are often required to complete several cycles of intrauterine insemination (IUI) and transition to ART only if these cycles are unsuccessful. During such treatments preceding ART, a selection process may occur based on response to medications in which patients with unfavorable responses are counseled towards using donor oocytes (especially when insurance covers donor oocyte cycles) (9–11) or encouraged not to move forward with treatment at all. The consequences of discouraging poor prognosis patients from care might be less significant in high-volume practices in mandated states than in practices in states where coverage is limited and in which there is greater financial pressure to treat poor prognosis patients. Such a dynamic could reduce the numbers of poor prognosis patients from the non-donor ART pool in states with comprehensive coverage and enrich it with patients less likely to have DOR; the opposite effect would be expected in non-mandated states.

Patients with DOR in states with mandated ART coverage might also withdraw from ART treatment if early follicular FSH levels exceed the thresholds required by certain insurance providers to authorize coverage of a cycle (9–11). To evaluate a possible role of FSH-based exclusion of DOR patients from treatment as a possible explanation for diminished representation of DOR cycles in mandated states, a sensitivity analysis was performed using cycles in which elevated FSH was defined as a patient maximum FSH up to 15IU/L. Using this cut point for the definition of elevated FSH did not change the significant associations between mandated insurance coverage of ART and odds of DOR diagnosis. This suggests that the selection of more favorable cycles with lower FSH values is not the primary driving force in the diminished prevalence of DOR diagnosis in mandated states (data not shown).

In our analysis of cycles between 2004 and 2007, a significant upward trend in the prevalence of DOR and Elevated FSH as primary diagnoses in ART cycles was noted and was independent of factors such as age, gravidity, and insurance coverage. The most likely explanation for this pattern is the growing utilization of sensitive markers of ovarian reserve such as Anti-Mullerian Hormone and antral follicle count that increase the likelihood of identifying cases of DOR (12–17). However, further investigation is warranted to determine the underpinnings in the upward trend for cycles with Elevated FSH as a sole diagnosis.

Modeling ART outcome with logistic regression demonstrated that the adjusted odds of live birth was lower in DOR only cycles performed in states with mandated ART coverage than in states without it. No associations between live birth and insurance status were observed in Elevated FSH only cycles or in cycles performed in women up to age 37. If indeed live birth rates in DOR cycles are more favorable in states with limited insurance coverage, our analysis suggests that variations in embryo transfer practices – an explanation that has traditionally been used to account for differences in treatment outcomes according to

insurance coverage (7, 8) – is not the primary explanation as this was adjusted for in our models.

Among the strengths of this study is the large numbers of cycles available for analysis of DOR. This provided sufficient power to describe associations that would otherwise be very challenging to test. We choose to only examine cycles classified in the database as initial ART cycle to prevent the influence of repeated cycle bias on the results described. Since the unit of measure in SART-CORS is a cycle and since the cycles are not linked, multiple cycles from an individual patient can be represented in the data set over time. By limiting the analysis to the first cycle of an individual patient we eliminated the possibility that the trends and associations reported are not impacted by a potential overrepresentation of DOR cycles from individuals who required multiple attempts to conceive. By lowering the significance level to $p<0.0001$ the stringency of our statistical testing was strengthened as was our confidence that the associations that met that level of significance were not spurious and based primarily on a large sample size and multiple comparisons.

The Society of Assisted Reproductive Technology definition of DOR is “a reduced ability of the ovary to produce eggs due to either advanced age, congenital, medical, or surgical causes” (18). This description indicates that a significant degree of heterogeneity is likely in the group of patients characterized as DOR in SART-CORS. It suggests, for instance, that a patient could be classified as having DOR based purely on age even when markers of ovarian reserve are not elevated. Given the assumed non-uniformity in defining DOR across the various clinics submitting data to SART, additional methods of capturing DOR in the database were utilized. A range of FSH values was derived from the ‘Patient Maximum FSH Level SART’ field corresponding to the 90–99% of values in women up to age 40 and in women up to the age of 37 that was characterized as elevated. The difference in numbers of cycles with DOR only (9,756) compared to Elevated FSH only (3,015) in women up to 40 reflects the heterogeneity in the cycles submitted to SART with DOR. This difference may also reflect the fact that when deriving a range of elevated values, we excluded very high values found in the database (>21 IU/L) and values that are considered to be mildly elevated (10–10.9 IU/L). Nevertheless, when focusing on a discrete marker of ovarian reserve to define DOR, a significant association with insurance coverage was demonstrated.

Our ability to draw detailed conclusions about the full impact of insurance on the odds of DOR diagnoses in an initial ART cycle is limited by a lack of demographic and patient level data that could confound this association. We did not have access to detailed indicators of SES such as income, employment status, and educational attainment as the SART- CORS database does not provide this. Knowledge of duration of infertility prior to the initiation of ART and of referral patterns would shed light on whether insurance mandates impact these correlates of treatment access and contribute to an explanation of our results. However, these data are not available in the SART-CORS database.

As concerns the classification of cycles by insurance, we cannot know what proportion of the cycles in a given state match the mandate status of that state. For instance, a proportion of cycles in a state that lacks mandated ART coverage will involve individuals who have coverage for ART through their private insurance. Similarly, some patients residing in states without mandated ART coverage will travel to states with coverage and pay for ART out of pocket. We assume that while there is significant consistency between the majority of cycles in a given state and its insurance status, verification can only be known with the collection of more detailed patient level data.

Finally, while all the states included in the ART mandate category do not have identical benefits for treatment, the categorization scheme that was utilized has been published

previously (8) and reflects the goal of this investigation to determine the relationship between any ART mandate and DOR prevalence and treatment outcomes. Specific mention should be made regarding the categorization of Connecticut as an IVF mandated state. Due to limits on our ability to access state-of-origin data for each ART cycle, cycles performed in Connecticut were categorized as IVF mandated despite the fact that the Connecticut mandate was enacted in 2005 and our investigation spans 2004–2007. Theoretically, it is possible that such misclassification could have biased our results either toward or away from the null hypothesis of no association between lack of IVF mandate and increased DOR prevalence. We believe that the likelihood of bias away from the null hypothesis is unlikely since the estimated number of fresh non-donor cycles reported to SART and performed in women up to age 40 in Connecticut between from 2004 to 2005 (1,922) was low relative to the total number of cycles contributed from that state during subsequent years and relative to the total number of cycles studied overall.

In summary, we have demonstrated that the prevalence of DOR in an initial cycle of ART is higher in states lacking mandated ART coverage. Our data also suggest that state ART mandate status is associated with pregnancy outcomes in some DOR cycles, a finding that requires further investigation. We speculate that mandated ART coverage may impact access to care in a way that effects the mix of patients that pursue care and initiate ART cycles. In addition, it is highly likely that insurance coverage is associated with additional factors and dynamics -- yet to be determined -- that influence the prevalence of DOR in ART patients. To elucidate these relationships further, future studies will need to evaluate individual state data taking into consideration the most current diagnostic strategies for DOR as well as detailed demographic, socioeconomic, and coverage data. Such research could contribute to an understanding of whether an expansion of mandates would further impact the diagnosis of DOR and the treatment of women with this condition.

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**Table 1**

Demographic Variables by DOR Status

| | **DOR only (9,756 cycles)** | **DOR+other Factors (13,588 cycles)** | **Controls (159,735 cycles)** | **Elevated FSH only (3,015 cycles)** | **Elevated FSH +other Factors (15,769 cycles)** | **Normal FSH (122,498 cycles)** |
|---|---|---|---|---|---|---|
| Age (mean, +/− SD) | 36.6 +/−3.3 p<0.0001[a] | 36.3 +/−3.5 p<0.0001[a] | 33.3 +/−4 | 36.2 +/−3.3 P<0.0001[a] | 35.2 +/−3.6, p<0.0001[a] | 33.7 +/−4 |
| Nulligravid | 52.7% (5,138) p<0.0001[a] | 52.7% (7,160) p<0.0001[a] | 56.1% (89,340) | 53.7% (1618) P=0.04[a] | 53.3%, p<0.0001[a] | 55.6% |
| Race/Ethnicity | White 76.8% Black 4.1% Asian 12.3% Latino 6.2% p<0.0001[b] | White 75.8% Black 5.6% Asian 11.3% Latino 6.7% p<0.0001[b] | White 75.3% Black 7.1% Asian 9.5 % Latino 7.5% | White 51.5% (1,527) Black 2.5% (75) Asian 7.6% (226) (226) Latino 4.4% (131) P<0.0001[b] | White 75.7% Black 6.6% Asian 10.9% Latino 6.1% p<0.0001[b] | White 74.1% Black 7.1% Asian 10.1% Latino 8.2% |
| FSH Max (mean, +/− SD) | 11.1 +/−37.2 p<0.0001[a] | 11.3 +/−42.3 p<0.0001[a] | 7.4 +/−36 | 13.8 +/−2.6 p<0.0001[a] | 13.3 +/−2. p<0.0001[a] | 6.6 +/−1.9 |

[a] p value for comparison to controls

[b] p value for proportion of cycles in White vs. Non-White women compared to controls

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**Table 2**

DOR Diagnoses in 1st IVF Cycles by Insurance Coverage, 2004–2007

| **Cycles in Women Up to Age 40** | **No ART Mandate** | **Mandated ART Coverage** | **P value[a]** | **Odds Ratio (95% CI)of DOR in States Lacking ART Coverage** | **P Value** |
|---|---|---|---|---|---|
| DOR | 13.9% (17,595/126,804 cycles) | 10.3% (5,749/55,975 cycles) | <0.0001 | 1.41 (1.36–1.45) | <0.0001 |
| DOR Only | 5.7% (7200/116,409 cycles) | 4.6% (2,556/52,782 cycles) | <0.0001 | 1.3 (1.24–1.36) | <0.0001 |
| Elevated FSH | 12.2% (11,409/93,354 cycles) | 9.7% (4360/44,913 cycles) | <0.0001 | 1.24 (1.19–1.29) | <0.0001 |
| Elevated FSH Only | 2.8% (2314/84,259 cycles) | 1.7% (701/41,204 cycles) | <0.0001 | 1.63 (1.50–1.78) | <0.0001 |
| **Cycles in Women Up to Age 37** | **No ART Mandate** | **Mandated ART Coverage** | **P value[b]** | **Odds Ratio (95% CI)of DOR in States Lacking ART Coverage** | **P Value** |
| DOR | 9.5% (9636/101,657 cycles) | 7% (3040/43,481 cycles) | <0.0001 | 1.39 (1.35–1.45) | <0.0001 |
| DOR Only | 3.8% (3585/95,606 cycles) | 3.0% (1,296/41,734 cycles) | <0.0001 | 1.39 (1.35–1.42) | <0.0001 |
| Elevated FSH | 10.5% (7707/73,487 cycles) | 8% (2,792/34,721 cycles) | <0.0001 | 1.34 (1.28–1.4) | <0.0001 |
| Elevated FSH Only | 1.9% (1301/67081 cycles) | 1.2% (400/32,329 cycles) | <0.0001 | 1.58 (1.41–1.77) | <0.0001 |

[a] p value for comparison of proportion of cycles with DOR according to state insurance status in women up to age 40

[b] p value for comparison of proportion of cycles with DOR according to state insurance status in women up to age 37

**Table 3**

Multivariable Analysis of Factors Associated with DOR Diagnoses

| Risk | % of cycles with DOR Only (n)[a] | Adjusted OR (95% CI) for DOR Only Diagnosis | p value | % of cycles with Elevated FSH Only (n)[a] | Adjusted OR for Elevated FSH Only (95% CI) | p value |
|---|---|---|---|---|---|---|
| **Gravid** | 6.2 (4,611) | Ref | <0.0001 | 2.5 (1,396) | Ref | |
| **Nulligravid** | 5.4 (7,160) | 1.09 (1.03–1.15) | | 2.3 (1,618) | 1.12 (1.04–1.21) | 0.002 |
| **Age** | | | | | | |
| <35 | 2.4 (2,276) | Ref | | 1.2 (830) | Ref | |
| 35–37 | 6.1 (2,605) | 2.71 (2.56–2.87) | <0.0001 | 2.8 (907) | 2.36 (2.15–2.6) | <0.0001 |
| 38–40 | 15.3 (4,875) | 7.67 (7.28–8.08) | <0.0001 | 4.9 (1,278) | 4.27 (3.9–4.67) | <0.0001 |
| **Year** | --- | 1.11 (1.09–1.13) | <0.0001 | --- | 1.12 (1.08–1.16) | <0.0001 |
| **ART Mandate** | 4.8 (2,556) | Ref | | 1.7% (701) | Ref | |
| **No ART Mandate** | 6.2 (7,200) | 1.43 (1.37–1.5) | <0.0001 | 2.8% (2,314) | 1.69 (1.56–1.85) | <0.0001 |

Odds ratios adjusted for gravidity, year in which cycle was performed, age at cycle initiation and state insurance status Some proportions may total greater than 100% due to rounding

[a]Proportion and number of cycles for each risk factor category with DOR

**Table 4**

Predictors of Live Birth in DOR Only Cycles

| | DOR Only Cycles | | | Elevated FSH Only Cycles | | |
|---|---|---|---|---|---|---|
| **Risl Factor** | **% of cycles Resulting in Live Birth (n)[a]** | **Adjusted OR of Live Birth (95% CI)** | **p value** | **% of cycles Resulting in Live Birth (n)[a]** | **Adjusted OR of Live Birth (95% CI)** | **p value** |
| **Gravid** | 21.5 (990) | Ref | | 21.8 (304) | Ref | |
| **Nulligravid** | 21.3 (1,095) | 0.91 (0.81–1.01) | 0.07 | 23.4 (379) | 1.04 (0.86–1.26) | 0.7 |
| **Age** | | | | | | |
| <35 | 30.3 (690) | Ref | | 38.7 (264) | Ref | |
| 35–37 | 22.4 (583) | 0.7 (0.59–0.8) | <0.0001 | 30.5 (208) | 0.72 (0.57–0.92) | 0.008 |
| 38–40 | 36.7 (812) | 0.43 (0.38–0.57) | <0.0001 | 30.9 (211) | 0.5 (0.38–0.61) | <0.0001 |
| **Oocytes Retrieved** | --- | 1.03 (1.02–1.04) | <0.0001 | --- | 1.04 (1.02–1.07) | <0.0001 |
| **Embryos Transferred** | --- | 1.11 (1.05–1.17) | <0.0001 | --- | 1.18 (1.07–1.3) | 0.001 |
| **ART Mandate** | 17.4 (444) | Ref | | 20.5 (144) | Ref | |
| **No ART Mandate** | 22.8 (1641) | 1.27 (1.11–1.44) | <0.0001 | 23.3 (539) | 1.08 (0.86–1.37) | 0.5 |

Odds ratios adjusted for gravidity, age at cycle initiation, micromanipulation (AH, ICSI), number of oocytes retrieved, number of embryos transferred, and state insurance status
Some proportions may total >100% due to rounding

[a]Proportion and number of cycles for each risk factor category