CLAIMS

That which is claimed is:

1. A method of ~~determining~~ predicting the probability that a female subject will experience a live birth event comprising the steps of:

(a) entering into a computer system variables known to be associated with or influence a female subject's chance of experiencing a live birth event, wherein the computer system comprises ~~an algorithm that determines the probability of a live birth event based upon at least two of the variables~~a prediction model comprising at least one statistical technique that calculates the probability that a female individual will experience a live birth event based upon at least four variables selected from the group consisting of female age, clinical diagnosis; clinical treatment information, medication, previous infertility history, number of previous pregnancies, number of previous term deliveries, number of spontaneous miscarriages, body mass index, diminished ovarian reserve, endometriosis, hydrosalpinx, polycystic ovarian disease, tubal disease, tubal ligation, male infertility, male infertility causes, unexplained female infertility, uterine fibroids, other causes of female infertility, contraceptive use, number of motile sperm before wash, number of motile sperm after wash, number of total motile sperm after wash, number of total motile sperm before wash, and day 3 follicle stimulating hormone (FSH) level;

(b) validating the ~~probability~~ prediction model of step (a) against at least one independent data set comprised of a group of female individuals with fertility profiles, wherein the at least four variables of step (a) are represented in at least one of the fertility profiles; and

(c) determining which of the variables of step (a) apply to the female subject and entering those variables into the computer system, wherein the computer system ~~determines~~ calculates the validated probability of the female subject having a live birth event based upon the at least four variables of step (a).

2. ~~A~~ The method of ~~determining the probability that a female subject will experience a live birth event from an in vitro fertilization (IVF) procedure comprising the steps of:~~

~~(a) entering into a computer system variables known to be indicative of responsiveness to an IVF procedure, wherein the computer system comprises an algorithm that determines the probability of a live birth event based upon at least two of the variables;~~

~~(b) validating the probability model of step (a) against at least one independent data set; and~~

~~(c) determining which of the variables of step (a) apply to the female subject and entering those variables into the computer system, wherein the computer system determines the validated probability of the female subject having a live birth event from an IVF procedure~~claim 1, wherein the female subject is a pre-oocyte retrieval (pre_OR) patient or a post in vitro fertilization (post-IVF) patient undergoing an in vitro fertilization (IVF) procedure.

3. ~~A~~ The method of ~~determining the probability that a female subject will experience a live birth event from an in vitro fertilization (IVF) procedure comprising the steps of:~~

~~(a) entering into a computer system~~

~~(i) variables known to be indicative of responsiveness to an in vitro fertilization procedure, and~~

~~(ii) expression levels of infertility indicator genes known to be indicative of responsiveness to an IVF procedure, wherein the computer system comprises an algorithm that determines the probability of a live birth event based upon a combination of at least two variables of step (a)(i) and at least one infertility indicator gene;~~

~~(b) validating the probability model of step (a) against at least one independent data set;~~

~~(c) determining which of the variables of step (a)(i) apply to the female subject and entering those variables into the computer system, and~~

~~(d) obtaining the female subject's expression levels of the indicator genes of step (a)(ii) and entering the expression levels of the female subject's indicator genes into the computer system,~~

~~wherein the computer system determines the validated probability of the female subject having a live birth event from an IVF procedure~~claim 1, wherein the female subject is a pre-in vitro fertilization (pre-IVF) patient.

~~4. The method of claims 1, 2, or 3, wherein the computer system determines the probability of the live birth event based upon selection of at least four variables.~~

~~5. The method of claims 1, 2, or 3, wherein the female subject is a pre-in vitro fertilization (pre-IVF) patient.~~

~~6. The method of claims 1, 2, or 3, wherein the female subject is a pre-oocyte retrieval (pre-OR) patient.~~

~~7. The method of claims 1, 2, or 3, wherein the female subject is a post-in vitro fertilization (post-IVF) patient.~~

~~84~~. The method of ~~claims 2 or 3~~claim 2, wherein said IVF procedure is at least a second IVF procedure for said female subject.

~~95~~. The method of claim 2~~ or 3~~, wherein said IVF procedure comprises determining a number of embryos for implantation.

~~106~~. The method of ~~claims 1, 2, or 3~~claim 2, 3, 4, or 5, wherein the at least four variables of step (a) ~~are~~ further comprise variables selected from the group consisting of ~~age of female subject, clinical diagnosis, clinical treatment information, medication, number of days of stimulation, previous infertility history, number of previous pregnancies, number of previous term deliveries, number of spontaneous miscarriages, body mass index, diminished ovarian reserve, endometriosis, hydrosalpinx, polycystic ovarian disease, tubal disease, tubal ligation, male infertility, male infertility causes, unexplained female infertility, uterine fibroids, other causes of female infertility, contraceptive use,~~ sperm collection, sperm from donor, age of sperm donor or male partner, methods and origin of sperm collection, ~~number of motile sperm before wash, number of motile sperm after wash, number of total motile sperm after wash, number of total motile sperm before wash, day 3 follicle stimulating hormone (FSH) level,~~ endometrial thickness, ultrasound monitoring results, oral contraceptive use, flare protocol, IVF protocol, total amount of gonadotropins administered and/or required, performance of ICSI (intracytoplasmic sperm injection), total number of oocytes, number or percent of normal and mature oocytes, number or percent of normally fertilized eggs, number or percent of unfertilized eggs, number or percent of abnormally fertilized eggs, total number of embryos, assisted hatching, average grade of embryos, average number of cells per embryo, blastocyst development rate, compaction on day 3, rate of cleavage arrest, number or percent of embryos arrested at 4-cell stage, day of embryo transfer, number or percentage of 8-cell embryos, number or percentage of 8-cell embryos transferred, number or percentage of blastocysts, number or percentage of cryopreserved embryos, number or percentage of cryopreserved oocytes, type of catheter used, season of procedure, and year of procedure~~, and combinations of any of the foregoing~~.

~~11~~7. The method of ~~claims 1, 2, or 3~~claim 1, wherein the prediction model comprises an algorithm that provides for a weighted relative importance of one variable from step (a) in relation to one or more other variables from step (a).

~~12~~8. The method of claim ~~11~~7, wherein the algorithm weighs the variables according to relative importance.

~~13~~9. The method of ~~claims 1, 2, or 3~~claim 1, wherein the ~~algorithm~~ prediction model comprises a decision rule.

~~14~~10. The method of ~~claims 1, 2, or 3~~claim 1, wherein the ~~algorithm~~ prediction model comprises a classification tree.

~~15~~11. The method of ~~claims 1, 2, or 3~~claim 1, wherein the prediction model comprises an algorithm that is nonparametric.

~~16. The method of claim 15, wherein the nonparametric algorithm comprises a Wilcoxon Signed Rank Test.~~

~~17~~12. The method of ~~claims 1, 2, or 3~~claim 1, wherein the prediction model comprises an algorithm that detects differences in a distribution of feature values.

~~18~~13. The method of ~~claims 1, 2, or 3~~claim 1, wherein the ~~algorithm~~ prediction model comprises a multiple additive regression tree.

~~19~~14. The method of ~~claims 1, 2, or 3~~claim 1, wherein the ~~algorithm~~ prediction model comprises gradient boosting.

~~20~~15. The method of ~~claims 1, 2, or 3~~claim 1, wherein the ~~algorithm~~ prediction model comprises logistic regression.

16. The method of claims 1, 2, or 3, wherein at least one of the at least four variables comprises expression levels of infertility indicator genes known to be indicative of responsiveness to an IVF procedure.

~~21~~17. The method of claim ~~3~~16, wherein the ~~at least one~~ infertility indicator ~~gene of step (a)(ii) is~~genes are selected from the group consisting of ADM, β-ACTIN, BCLAF1,

BMPR1A, BRF2, BTAF1, BTBD14A, CBX4, CCNA1, CCNA2, CDC2, CDH1, CDH2, CDT1, CENPE, CITED2, CPSF4, CPSF6, CRB3, CSE11, CS1L, CTSB, DIDO1, DNMT3A, DNMT3B, DPPA5, E112, ECSIT, EIF2C5, EIF2S1, EIF3B, EIF3C, EIF3E, EIF3G, EIF3H, EIF3S, EIF3S10,EIF4E, EIF4E2, EIF4G1, EIF5B, EIF6, ETF1, ETV1, EZH2, FGF4, FGFR1, FGFRL1, GATA4, GATA6, GAPDH, GEN5, GJA1, GTF3C1, GTF3C2, GTF3C4, GTF3C5, H3F3A, HAT1, HBEGF, HIPK1, HIPK3, HNRPA1, HNRPAB, HRNPK, HNRPM, I117RD, IGF2R, IMP1, INTS4, INTS7, JMJD2A, JMY, KDM3A, KDM3B, KDM5B, KDM5C, KFF9, KIF11, KIF22, KITLG, KLF9, KRT16, LIN26, M113, MAPK1, MCM3, MCM5, MED8, MED14, METT12, MKRN1, MRIF1, MTA2, NANOG, NES, NRF1, OCT4, ORC41, PA2G4, PAPOLA, PARD3, PELP1, PIWIL2, PKNOX1, POLR2H, POLR3A, POLR3E, POLR3K, POU5F1, PPM1A, PPM1G, PPP2CB, PRKAG1, PRKCA, PRKCD, PRPF4, PRPF38B, PURB, RARS, RBM3, RBM4, RMB5, REST1, RFC2, RFC3, RSC8, SALL4, SESN1, SFRS15, SGPP1, SIRT1, SMARCA4, SMARCC1, SNUPN, SOX2, TAF9, TCEB3, TEFL5, TSTT1, UBTF, UGDH, and YY1~~, and combinations of any of the foregoing~~.

~~22~~18. The method of claim ~~3~~16, wherein the expression level of the ~~at least one~~ infertility indicator genes is determined from a procedure selected from the group consisting of a BioMark® Dynamic Array, RT-PCR, whole-transcriptome sequencing, and combinations of any of the foregoing.

~~23~~19. The method of claim ~~3~~16, wherein the expression level of the at least one infertility gene is determined for an embryo or an oocyte.

~~24~~20. The method of claim ~~23~~19, wherein the embryo or oocyte is in arrested development.