



AMH in Gynecology

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Vail OB-GYN Conference

February 20, 2025



Disclosures

I have no disclosures.

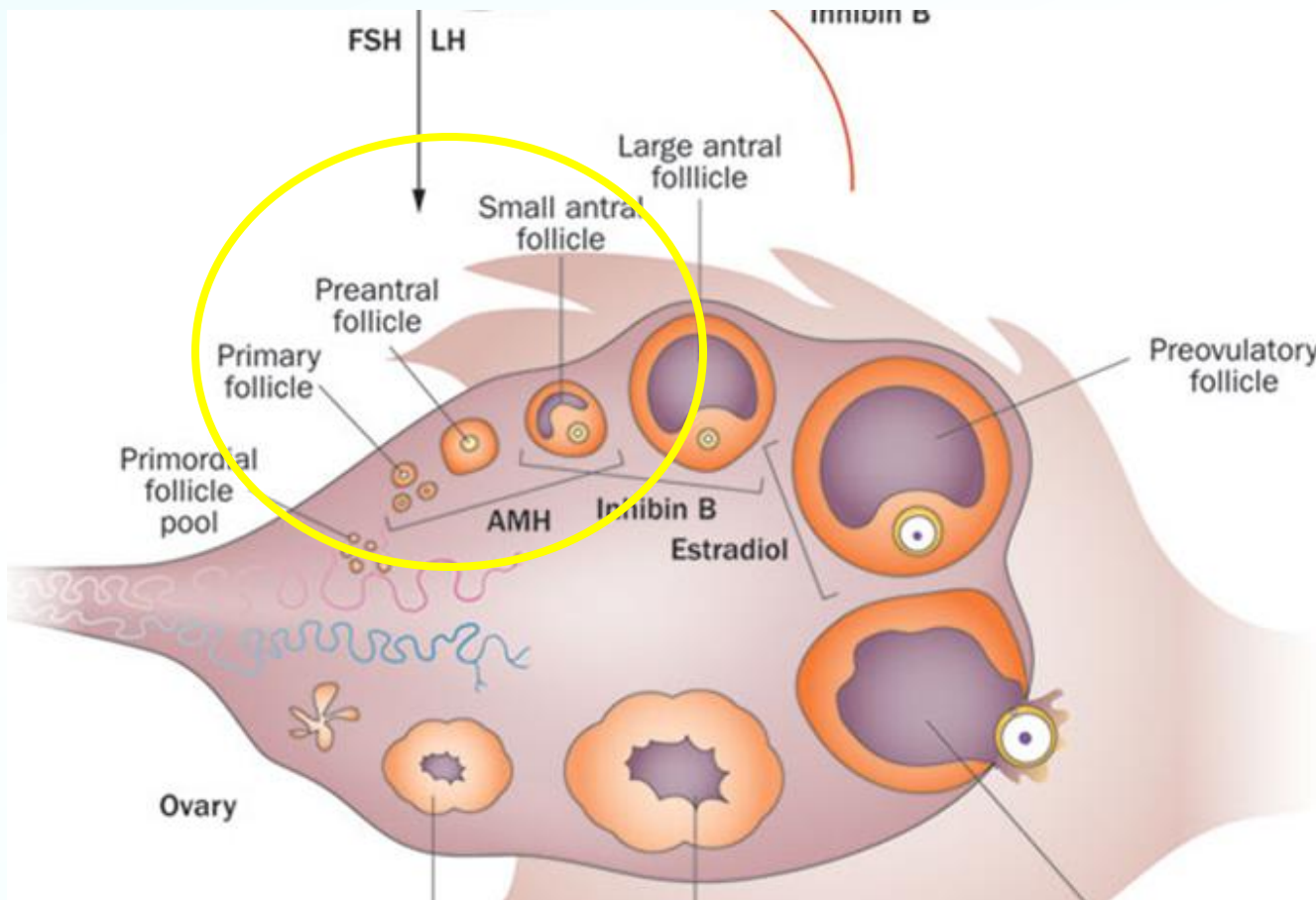


OBJECTIVES

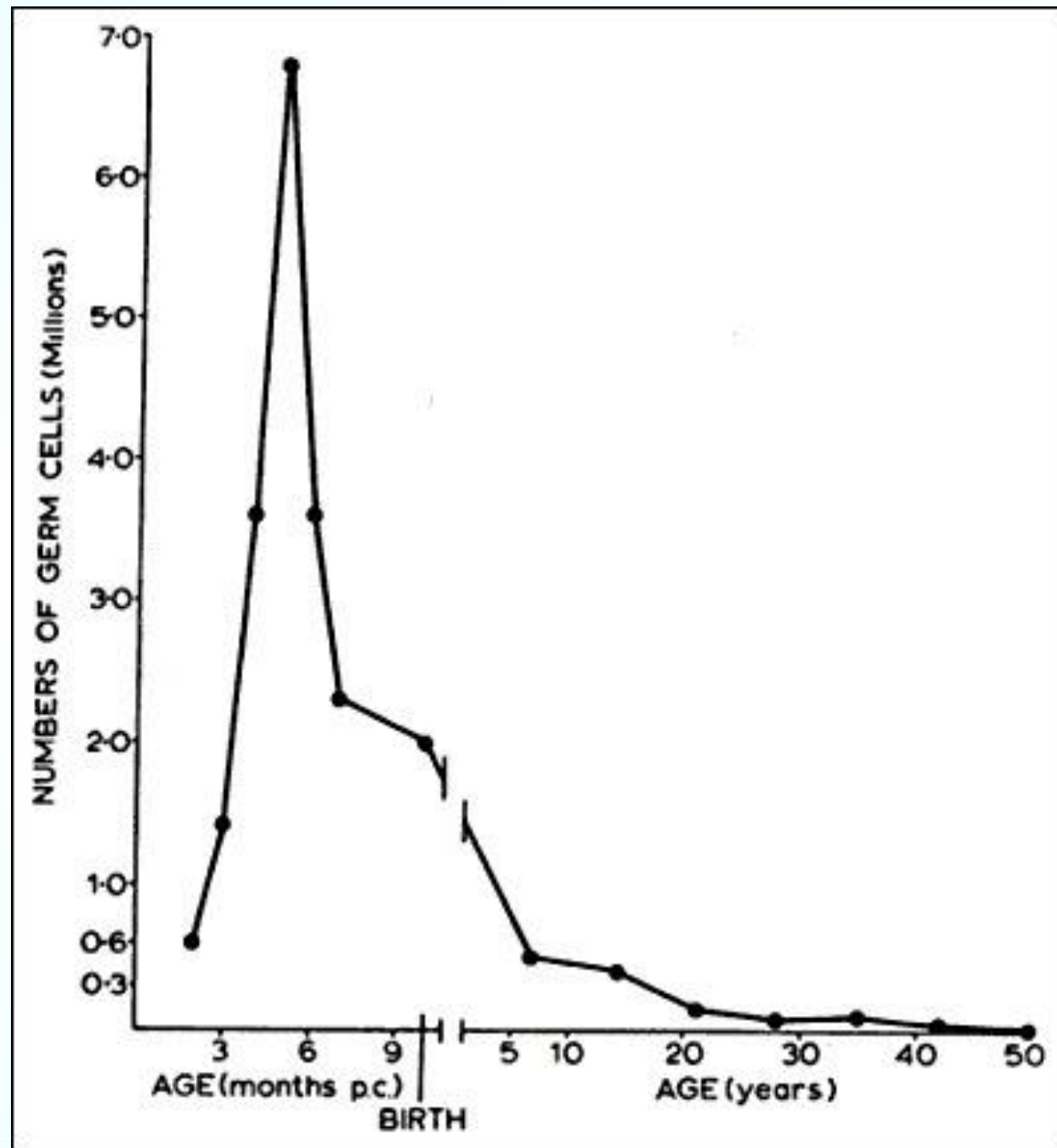
1. Recognize what AMH is and normal ranges
2. Review the utility of AMH in the infertile couple
3. Understand the role of AMH in the non-infertile patient



What is anti-mullerian hormone (AMH)?



- 140 kDa glycoprotein
- Produced during normal embryogenesis by the Sertoli cells of the embryonic testis
- Produced by granulosa cells in the ovary
- Prevents follicular activity
- Minimal intracycle variability
- Marker of ovarian reserve



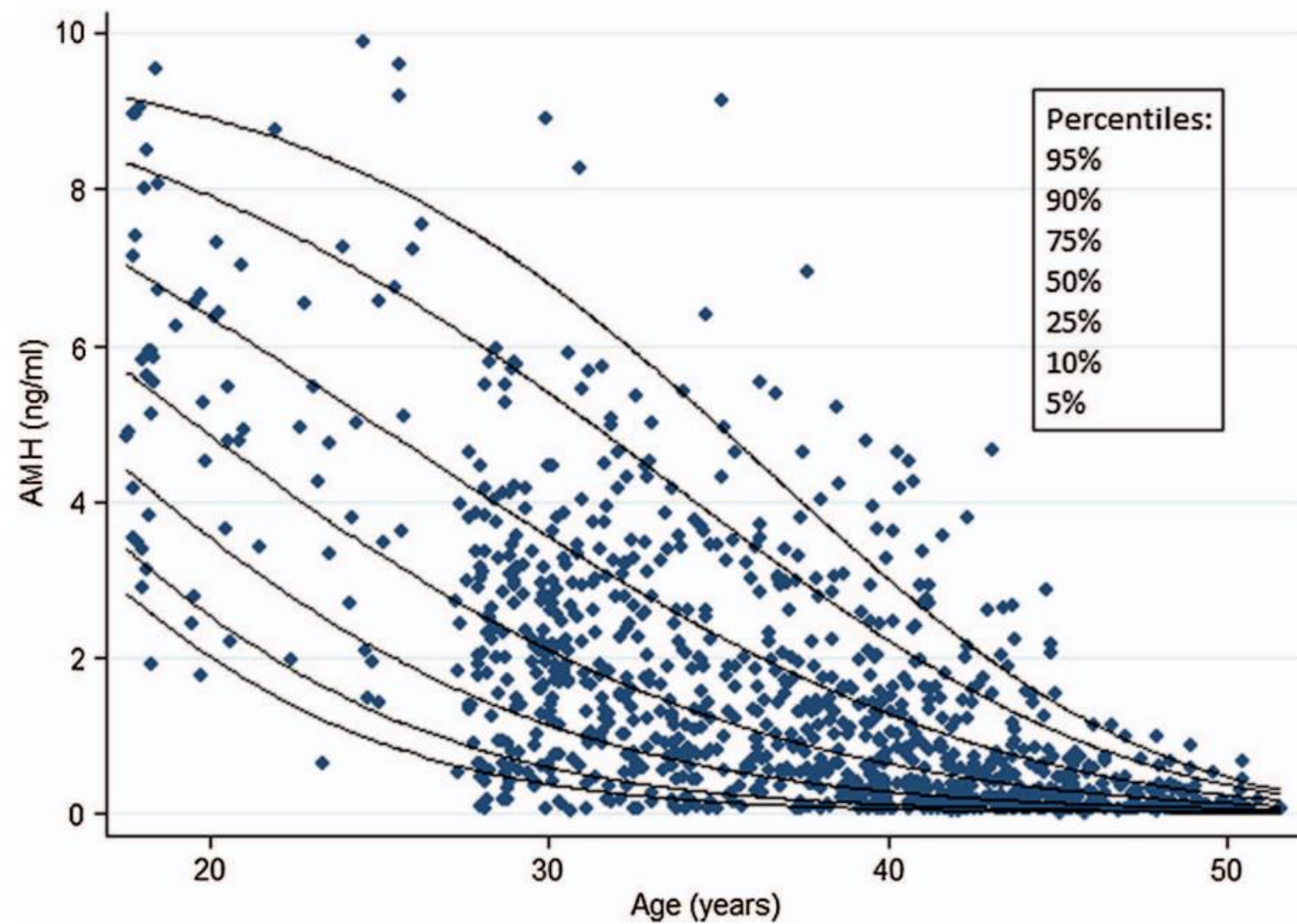


Figure 1 Anti-Müllerian hormone (AMH) percentiles in 1015 women

TABLE 2

Fitted age-specific percentile values for serum AMH level for women of reproductive age

Age	n (%)	2.5th	10th	25th	50th	75th	90th	97.5th
21	46 (0.5)	0.79	1.83	3.06	4.83	7.34	10.91	18.41
22	66 (0.7)	0.78	1.79	3.00	4.75	7.23	10.74	17.97
23	104 (1.1)	0.76	1.75	2.93	4.66	7.12	10.56	17.52
24	137 (1.5)	0.74	1.70	2.86	4.57	7.00	10.37	17.06
25	174 (1.9)	0.72	1.65	2.78	4.47	6.86	10.16	16.58
26	215 (2.4)	0.69	1.59	2.70	4.35	6.70	9.92	16.06
27	230 (2.5)	0.66	1.52	2.59	4.21	6.52	9.64	15.52
28	288 (3.2)	0.61	1.44	2.48	4.05	6.30	9.33	14.95
29	406 (4.5)	0.56	1.34	2.34	3.87	6.05	8.98	14.38
30	431 (4.7)	0.50	1.24	2.20	3.67	5.77	8.60	13.82
31	437 (4.8)	0.44	1.13	2.05	3.48	5.48	8.21	13.24
32	446 (4.9)	0.38	1.03	1.90	3.25	5.19	7.81	12.63
33	409 (4.5)	0.33	0.93	1.75	3.04	4.89	7.38	11.93
34	347 (3.8)	0.28	0.84	1.60	2.82	4.57	6.93	11.16
35	383 (4.2)	0.24	0.74	1.45	2.59	4.25	6.46	10.35
36	419 (4.6)	0.20	0.64	1.29	2.36	3.91	5.98	9.56
37	443 (4.9)	0.15	0.54	1.13	2.11	3.57	5.50	8.83
38	334 (3.7)	0.11	0.43	0.96	1.86	3.21	5.02	8.15
39	324 (3.6)	0.07	0.33	0.79	1.60	2.85	4.53	7.44
40	384 (4.2)	0.05	0.24	0.63	1.35	2.48	4.03	6.68
41	360 (4.0)	0.03	0.17	0.48	1.10	2.12	3.52	5.88
42	356 (3.9)	0.02	0.11	0.35	0.87	1.77	3.03	5.12
43	344 (3.8)	0.01	0.07	0.24	0.67	1.45	2.57	4.48
44	310 (3.4)	<0.01 ^a	0.04	0.16	0.49	1.14	2.15	3.92
45	360 (4.0)	<0.01 ^a	0.02	0.10	0.33	0.86	1.74	3.40
46	401 (4.4)	<0.01 ^a	0.01	0.06	0.21	0.61	1.35	2.88
47	382 (4.2)	<0.01 ^a	0.01	0.03	0.13	0.41	1.00	2.41
48	366 (4.0)	<0.01 ^a	<0.01 ^a	0.02	0.07	0.26	0.71	2.01
49	210 (2.3)	<0.01 ^a	<0.01 ^a	0.01	0.04	0.15	0.50	1.77

AMH, antimüllerian hormone.

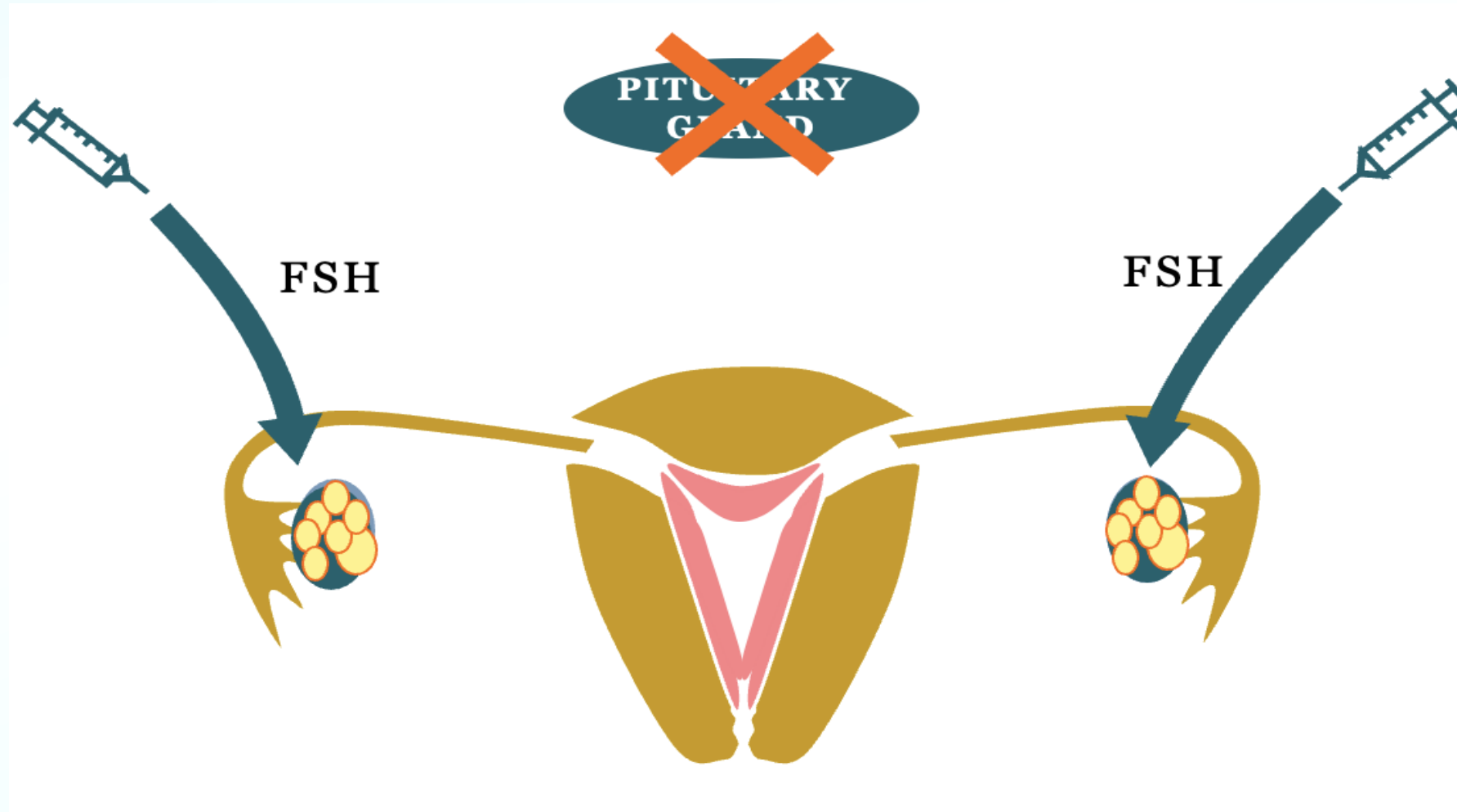
^a Below the limit of the detection value of AMH (0.01 ng/mL).Hao. Age-specific antimüllerian hormone reference values. *Am J Obstet Gynecol* 2022.

What is the role of AMH in infertility?

- Predicts oocyte yield from controlled ovarian stimulation
- Helps assess dose for gonadotropins
- Predicts those at risk for ovarian hyperstimulation syndrome
- Can help to assess ART success though age is still a large factor



AMH predicts response to gonadotropins



Can AMH predict menopause?

- Limited by different assays, their sensitivities
- AMH $<0.2\text{ng/mL}$ had a median time to menopause of 6 years
- 60% of patients with AMH $<0.2\text{ng/dL}$ underwent menopause within 5 years
- Undetectable AMH ($<0.0018\text{ ng/mL}$) can predict final menstrual period (FMP) within the next 12 months when taken in conjunction with age using an ultrasensitive AMH assay



AMH and PCOS

Step 1: Irregular cycles + clinical hyperandrogenism

(exclude other causes)* = diagnosis

Step 2: If no clinical hyperandrogenism

Test for biochemical hyperandrogenism (exclude other causes)* = diagnosis

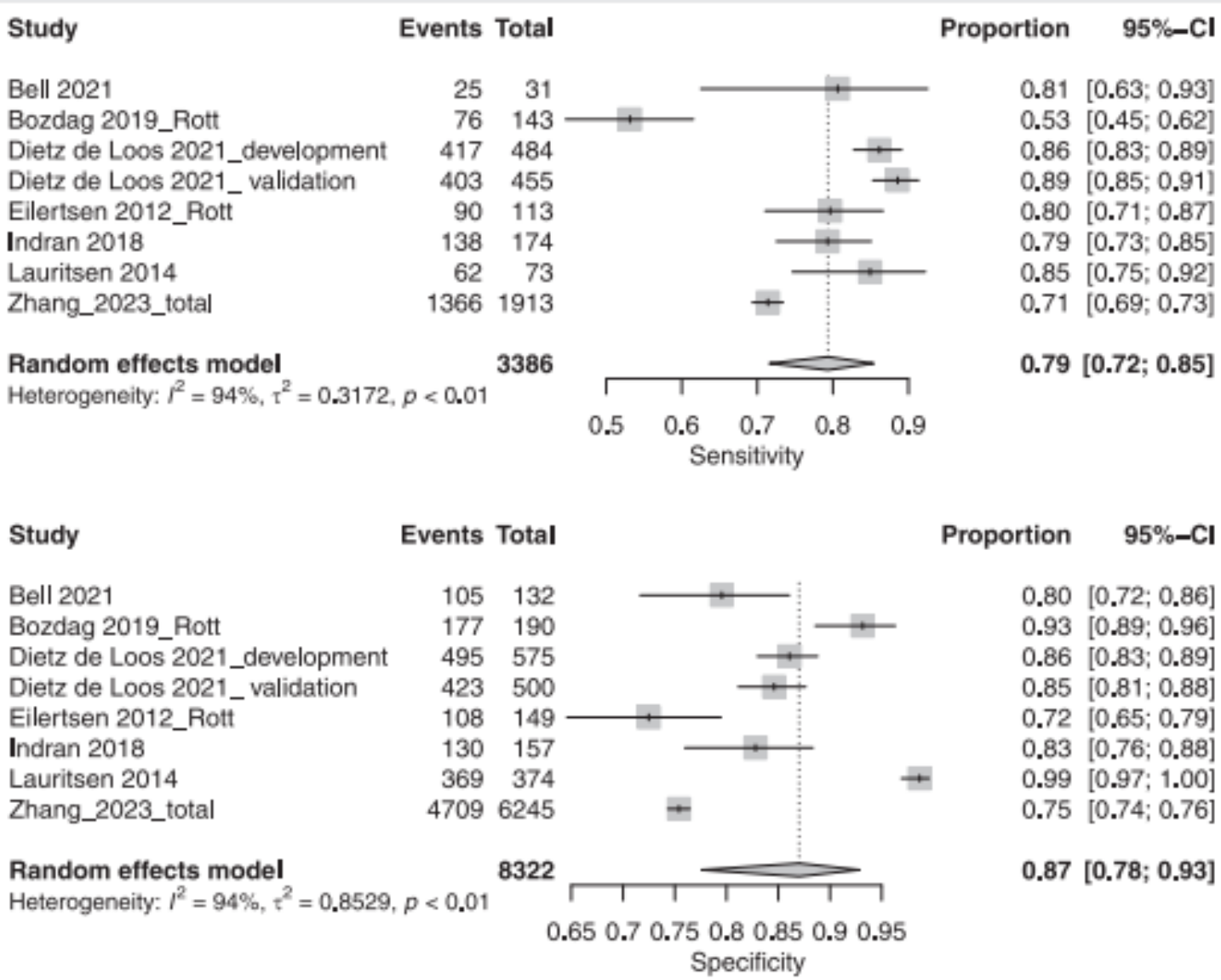
Step 3: If ONLY irregular cycles OR hyperandrogenism

Adolescents ultrasound is not indicated = consider at risk of PCOS and reassess later
Adults - **request ultrasound for PCOM***, if positive (exclude other causes)* = diagnosis

* Exclusion of other causes = TSH, prolactin, 17-OH progesterone, FSH or if clinically indicated exclude other causes (e.g. Cushing's Syndrome, adrenal tumours). For hypogonadotrophic hypogonadism, usually due to low body fat or intensive exercise, exclude clinically and with LH/ FSH.
PCOM = polycystic ovarian morphology on ultrasound



AMH and PCOS



Forest plot of pooled sensitivity and pooled specificity of antimüllerian hormone levels as a marker for detecting polycystic ovarian morphology. CI, confidence interval.

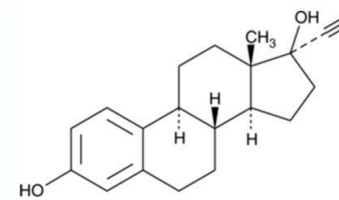
van der Ham. AMH as a biomarker for PCOS and PCOM. Fertil Steril 2024.



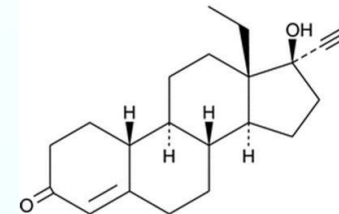
Effect of contraceptive use on AMH

- Suppressive effect on follicular development
- Varies among contraceptive type, most profound in COC users
- AMH appears to rebound after 2 months
- AMH returns to levels of non-users

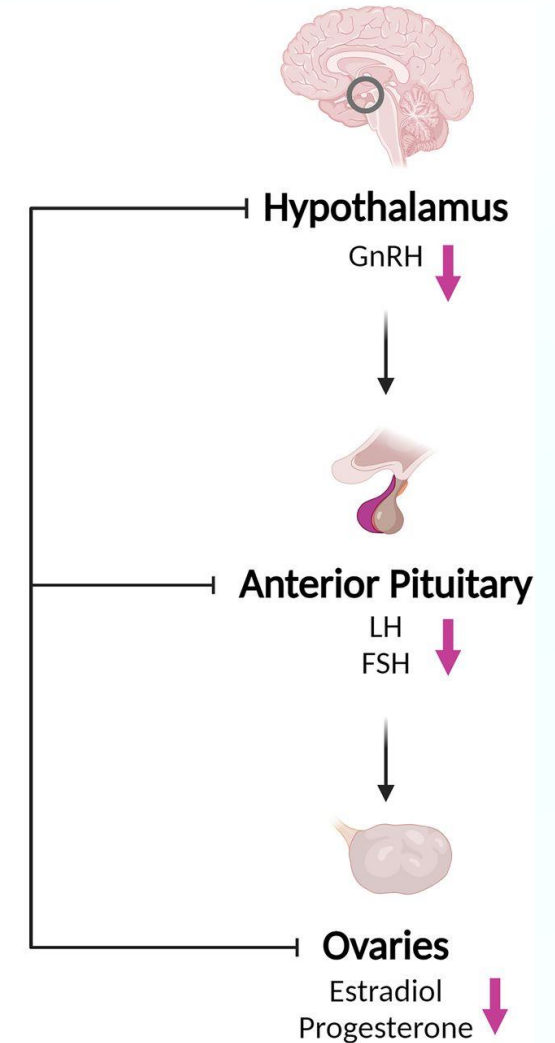
Contraceptive Hormones



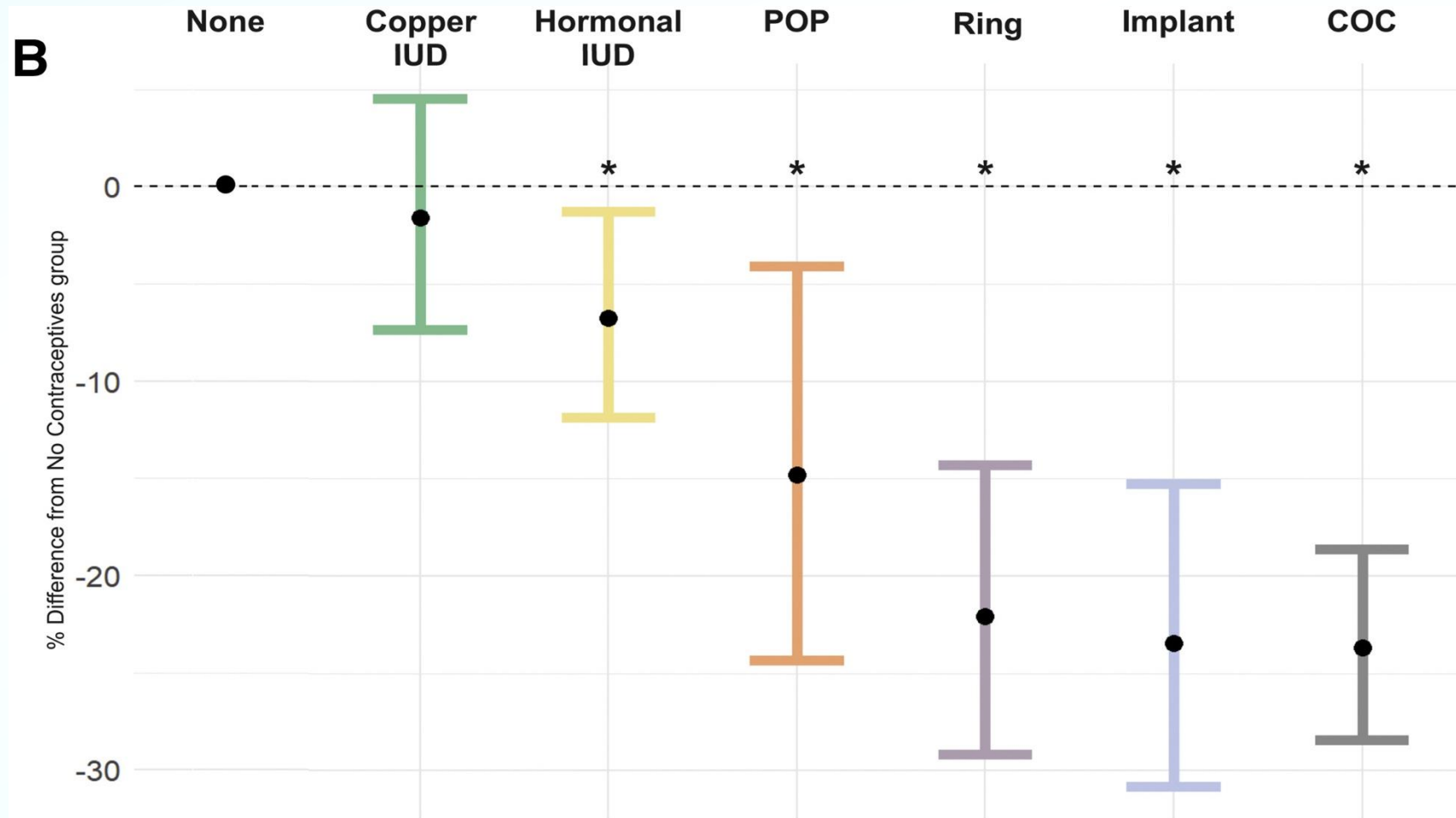
Ethinyl estradiol

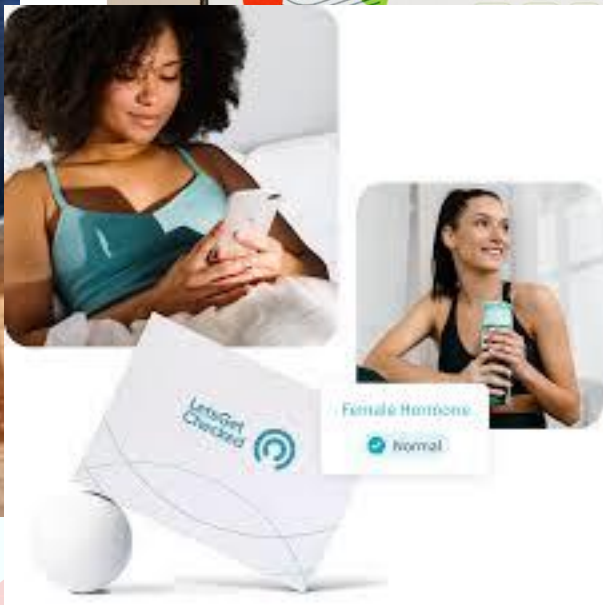


Levonorgestrel



Effect of contraceptive type on AMH



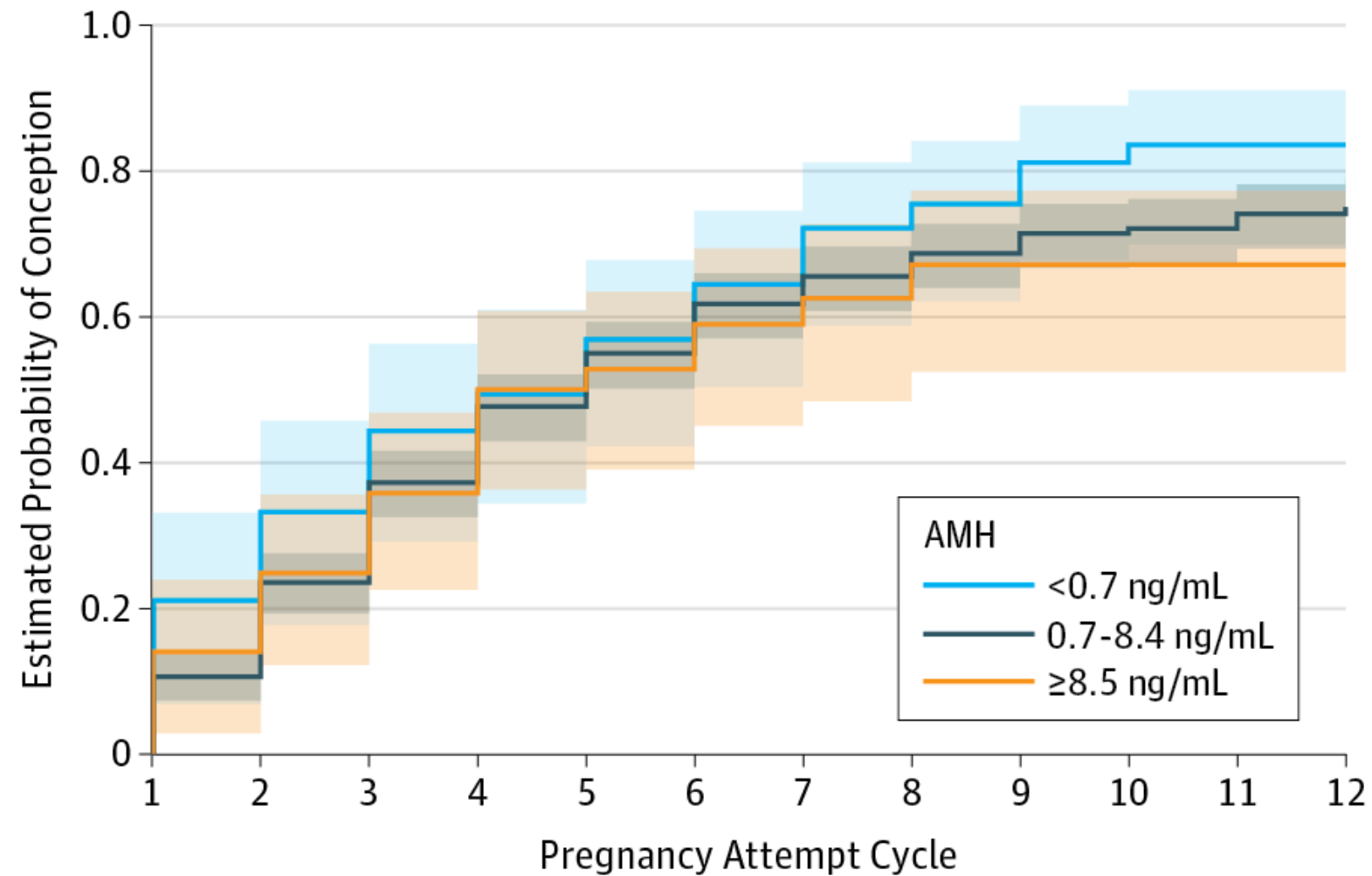


Does AMH predict natural fecundability?

- Low AMH does not seem to be more prevalent in a couple with infertility
- Low AMH (≤ 0.7 ng/mL) was not associated with time to pregnancy (Time to Conceive Study)
 - Prospective, 30-44 yo, 750 women
 - Cumulative pregnancy rates at 6 months and 12 months



A Cumulative probability of conception stratified by AMH levels



No. at risk by serum AMH level, ng/mL

<0.7	39	49	59	51	45	37	30	19	14	8	6	5
0.7-8.4	309	405	404	340	277	221	170	133	104	83	70	58
≥8.5	33	52	52	43	32	27	20	14	10	8	6	6

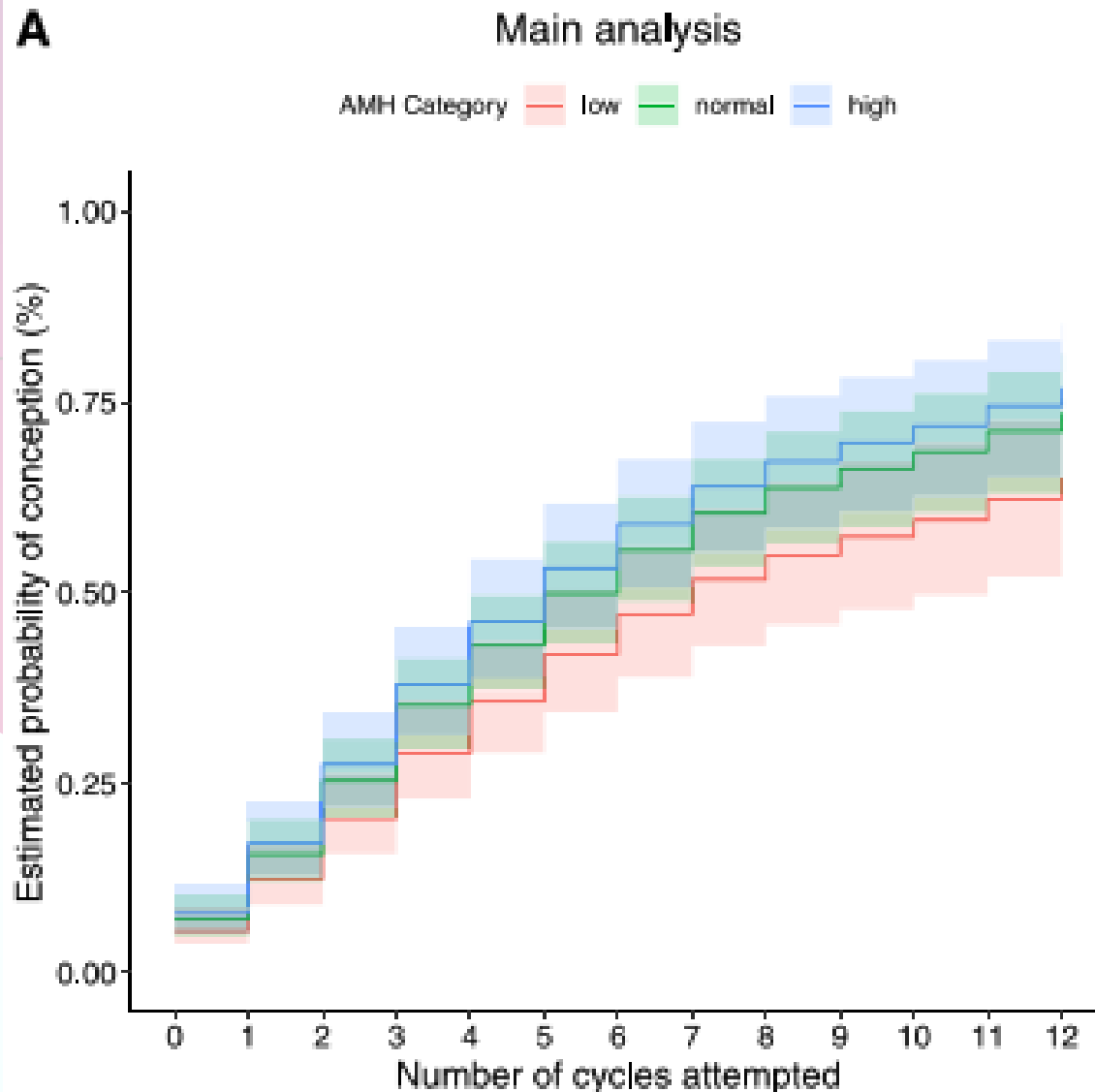


Does AMH predict natural fecundability?

- In those with a prior history of 1-2 miscarriages, AMH <1ng/mL was not associated with time to conceive (EaGER trial)
 - RCT low dose aspirin
 - 18-40 yo
 - 1202 women with baseline AMH
 - Low AMH (<1ng/mL) vs normal AMH (1-3.5ng/mL) now associated with ability to conceive (odds ratio 1.13, 95% CI 0.8-1.5)



Does low AMH predict natural fecundability?



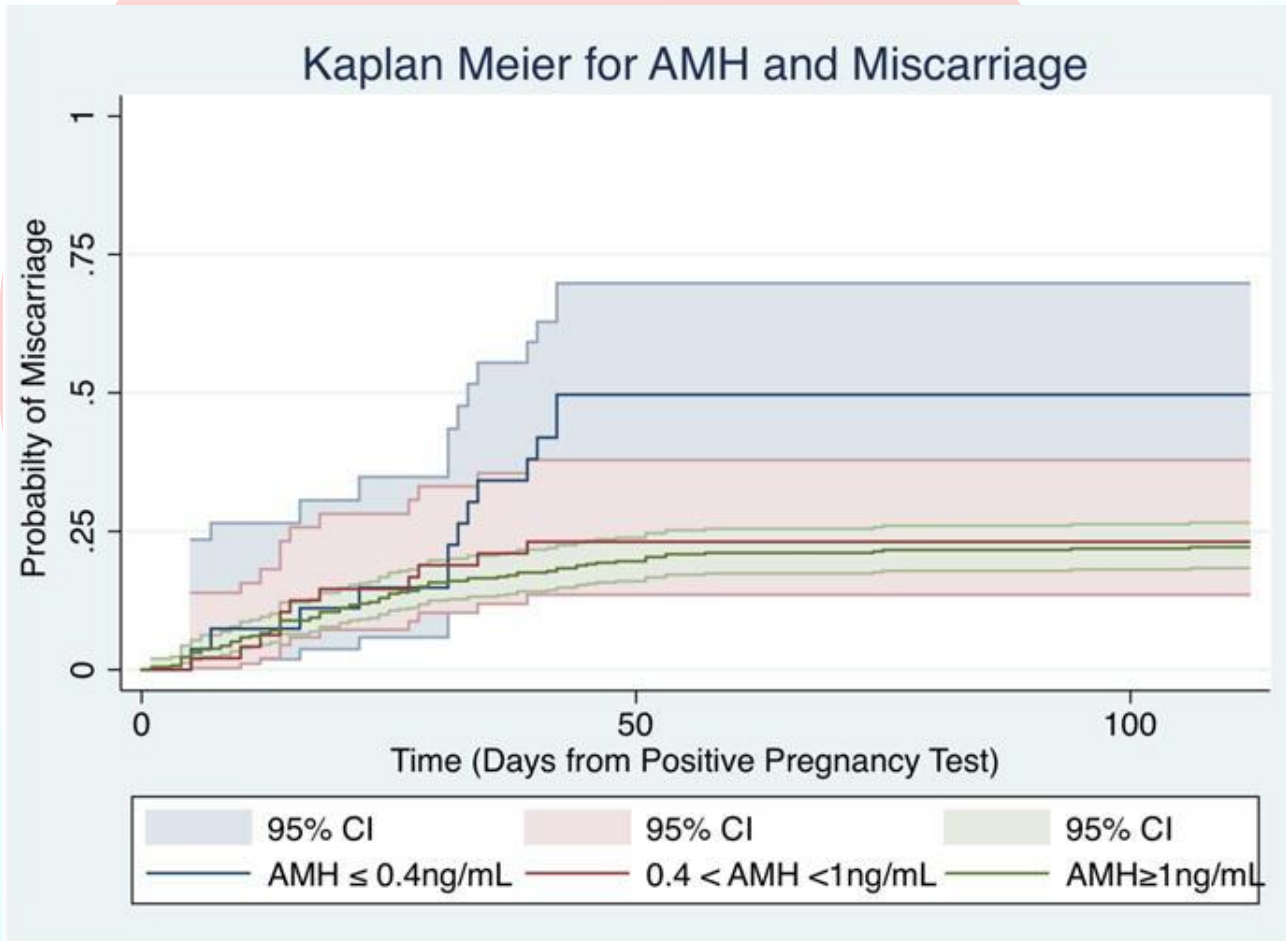
- Modern Fertility Study
 - Prospective, 3150 women, 21-45yo
 - Enrolled through Modern Fertility test + app
 - Low AMH <1 ng/mL had a lower chance of conceiving at 1 year (aHR, 0.77; 95% CI, 0.64-0.94)
 - Limitations: period tracking app, self reported outcomes, conflicts of interest, nonblinded

Does low AMH predict *future* fecundability?

- >3 year follow up of Time to Conceive study showed low AMH (≤ 0.7 ng/mL) did not have worse future fertility outcomes compared to normal AMH
 - Future fecundability (fecundability ratio, 0.97; 95% CI, 0.6-1.6)
 - Future live birth (RR 1.32; 95% CI, 0.9-1.8)
 - Future infertility (RR 0.65; 95% CI, 0.2-2.1)
 - Elevated FSH also not associated



Does low AMH predict miscarriage?



- TTC study found severely low AMH (<0.4 ng/mL) versus AMH >1 ng/mL was associated with increased risk of miscarriage, 50% versus 22% (HR 2.3; 95% CI, 1.3, 4.3)
- AMH 0.4-1ng/mL no difference
- Conflicting data on euploidy rate after IVF

ACOG COMMITTEE OPINION

Number 773

Committee on Gynecologic Practice

This Committee Opinion was developed by the American College of Obstetricians and Gynecologists' Committee on Gynecologic Practice in collaboration with committee members Amanda N. Kallen, MD, and Dale W. Stovall, MD.

The Use of Antimüllerian Hormone in Women Seeking Fertility Care

DO OVARIAN RESERVE TESTS PREDICT REPRODUCTIVE POTENTIAL AMONG WOMEN WITH UNPROVEN FERTILITY?

Ovarian reserve declines with age, as do fertility rates. This has led to the presumption that ovarian reserve should predict reproductive potential; however, this has not been borne out in studies so far. A number of studies have been conducted to assess the value of markers of ovarian reserve as markers of current reproductive potential. In prospective cohort studies, markers of ovarian reserve were poor predictors of reproductive potential as measured by fecundability (the probability of conceiving in a given menstrual cycle), cumulative probability of pregnancy, or incidence of infertility.

AMH should generally not be ordered on non infertile women to counsel on their reproductive status or future fertility potential.



Want more information about their fertility status but some are worried about “overthinking it.”



Empowerment through testing, feeling more “in control” regardless of actual utility of hormone levels.



Confusion is still present after test results return, even in those who are AMA and 45 years old





August 21, 2023

Websites Selling Direct-to-Consumer Anti-Mullerian Hormone Tests

Alexis Johnson, MPH¹; Rachel Thompson, PhD²; Brooke Nickel, PhD¹; [et al](#)[» Author Affiliations](#) | [Article Information](#)*JAMA Netw Open.* 2023;6(8):e2330192. doi:10.1001/jamanetworkopen.2023.30192

Stated limitations about the test		19 (70)
Not appropriate if using OCPs	"Note this test is not appropriate for individuals taking the oral contraceptive pill." (IScreen)	7 (26)
PCOS falsely inflates AMH	"Women with polycystic ovaries can have higher than expected results for their age." (Medichecks)	13 (48)
AMH is not predictive of chance of conceiving	"This test can't tell you your exact chances of falling pregnant. Or whether you are infertile. There is no sure-fire test that can. This Fertility Hormone test is the best first step in understanding your fertility proactively." (Kin Fertility)	9 (33)
Language suggesting empowerment and control	"My body, my data, my choice." (HeyGrip); "Be proactive about your fertility." (Modern Fertility)	7 (26)
Emphasizes convenience	"The only comprehensive fertility hormone test you can take in your jammies." (Modern Fertility)	24 (89)
Included statistics of the prevalence of infertility or premature menopause	"Why does it matter? About 1 in 100 people suffer from early ovarian failure, which basically means you enter menopause before 45. The hormone AMH correlates with the number of follicles that you have left in your ovarian reserve, and is the most reliable predictor that we've got." (HeyGrip)	6 (22)
Included an explicit statement that the test was suitable for a wide range of women, irrespective of attempts to conceive	"Whether you're years away from kids or thinking of trying soon, we'll guide you through your fertility hormones now so you have options later." (Kin Fertility)	10 (37)

Summary

Median AMH 3.6 ng/mL at 30 yo, 2.6 ng/mL at 35 yo, 1.3 ng/mL at 40 yo

AMH predicts response to gonadotropins for IVF, ovarian hyperstimulation syndrome risk

AMH can be reduced by contraceptive use, most profoundly with COCs

AMH could predict PCOM, no specific international threshold exists

AMH does not predict natural fecundity

Low AMH does not infer future infertility; association with egg quality is inconclusive



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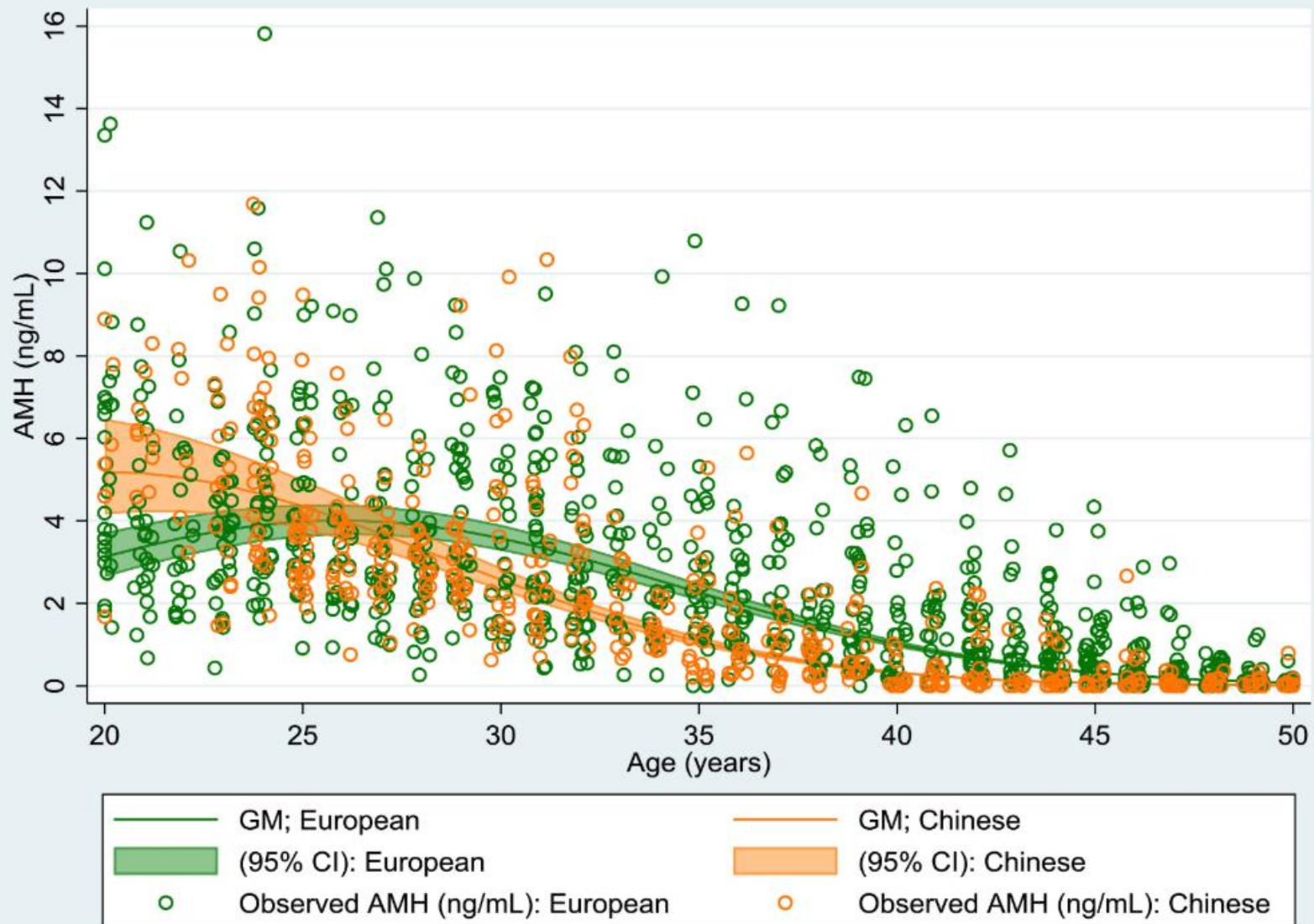
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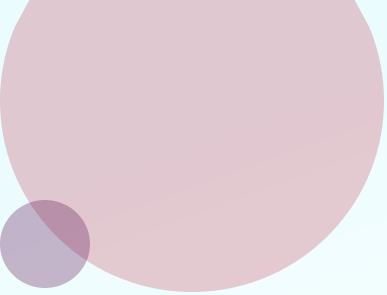


Questions?



Ethnicity and AMH





What else can we use AMH for?

Can be considered for PCOS (but not diagnostic)

Can predict a shortened reproductive window



AMH and obesity

1. Increased Body Mass Index Is Associated With A
2. Nondilutional Reduction in Antimüllerian Hormone
Eleni Greenwood Jaswa, Julie S
3. Rios, Marcelle I Cedars, Nanette F Santoro, Mary Ellen G
4. Pavone, Richard S Legro, Heather G Huddleston
- 5.

