

Statistically significant**NAMES:**

The July 17, 2002 edition of the *Journal of the American Medical Association* reported the following.

An experiment was performed to determine if hormone replacement therapy (HRT) was beneficial. The study followed 44,241 women, some on HRT and some not.

The researchers found “women who were taking estrogen hormone replacement therapy (HRT) had a significantly higher risk of developing ovarian cancer than women who had never used HRT.”

In other words, “the difference between ovarian cancer rates in HRT women and non-HRT women is statistically significant.”

1. Do you think it is possible that the study's results that say HRT caused increased rates of ovarian cancer occurred merely by chance. Is it possible that the women in the HRT group had somehow been predisposed to ovarian cancer, and that accounts for the increased rate? How would that affect the results of their study?

2. Explain what it means for the result to be statistically significant. Use complete sentences and the language of the HRT situation.

Discover magazine (January 2003) ranks the HRT debate to be one of the top 100 science stories of 2002. It is recreated below. Read it and answer the questions that follow.

“The end of the estrogen myth” – Millions of older women ping-ponged between shock, confusion, alarm, and anger in July when researchers dropped a bombshell: Hormone replacement therapy (HRT), long touted as a panacea that would slow aging, does more harm than good.

Until then, an estimated 14 million postmenopausal women were taking some form of estrogen, a widespread practice since the 1960s. Experts supported its use to ease the hot flashes and mood swings of menopause, keep bones strong, possibly prevent dementia – and reduce the risk of heart attack by as much as half. Then on July 9, the National Institutes of Health abruptly shut down a clinical trial of HRT because of safety concerns. In the first rigorous test of the treatment’s cardiovascular benefits in healthy women, 16,608 volunteers had been randomly assigned to take Prempro*, a mix of estrogen and progestin, or a placebo pill every day.

Five years of therapy helped prevent hip fractures and colorectal cancer. However, the HRT also led to eight more breast cancer cases, eight more strokes, and 18 more episodes of hazardous blood clots for every 10,000 women using Prempro each year. The big shocker: The drug boosted the odds of cardiac damage by 29 percent, causing seven additional heart attacks per 10,000 participants annually. The extra hazards outweighed the payoffs. Investigators advised women to stop using Prempro to avoid heart disease and consider other steps to ward off osteoporosis.

“It’s kind of an earthshaking and astounding event,” says Deborah Grady, director of the Mt. Zion Women’s Health Clinical Research Center at the University of California at San Francisco. Still, she argues, the scientific process didn’t break down. What happened was that doctors leaped in and started prescribing HRT before a carefully designed, randomized clinical trial like the 10-year NIH study could be carried out. Why? A compelling heap of observational and lab data had supported the hormones’ rejuvenating powers. Also, Grady says, there was aggressive marketing by drug firms and a pervasive “magical thinking” that estrogen must be good for women.

Meanwhile, many doctors continue to prescribe estrogens, apparently convinced that other forms will help their patients’ hearts. The evidence favoring that view? According to Grady, “Slim to none.” – Ingfei Chen, *Discover* magazine, January 2003

*Prempro is the name brand for “conjugated estrogens/medroxyprogesterone acetate tablets”.

Describe the National Institutes of Health study that was shut down on July 9. How many women were involved? What were the various treatments? How many years did the study continue? Give all important details.

Explain what is meant by “HRT led to eight more breast cancer cases **for every 10,000 women** using Prempro each year”.

Use the term “statistically significant” to describe the results quoted in *Discover*. Use complete sentences.

3. I asked fifty men and fifty women how they felt about the gender gap (inequities between men and women in our society). Sixty percent of the men felt the gender gap was over-hyped while only ten percent of women felt that way. I performed fancy statistics to determine the difference between men’s and women’s views were statistically significant. Restate this result using complete sentences and the language of the situation.

4. I asked fifty men and fifty women their favorite flavor of ice cream. Forty percent of men and forty-five percent of women said “chocolate”. I performed fancy statistics to determine the difference between men’s and women’s ice cream tastes were *not* statistically significant. Restate this result using complete sentences and the language of the situation.