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## Humility in Observational Studies

**THE WOMEN'S HEALTH INITIATIVE HORMONE** replacement therapy (HRT) study has shaken medical practice and left many women puzzling, as reflected in Martin Enserink's article "The vanishing promises of hormone replacement" (*News Focus*, 19 July, p. 325). Although many previous observational studies found substantial cardio-protection with HRT (1), two large, well-conducted clinical trials found no such "protection" (2, 3). Why were these earlier studies wrong? In all likelihood, although the observational studies "controlled" for a plethora of variables, they all suffered the same "selection bias"—women using HRT were healthier in other ways those studies didn't or couldn't address well.

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## SCIENCE'S COMPASS

Beyond HRT itself, however, the studies are a wake-up call for a range of disciplines including sociology, demography, epidemiology, and econometrics that often rely on such observational methods and attempt to "control" for variables statistically. For example, education is associated with positive social attributes including economic status, voter participation, lower cardiovascular disease, lower infant mortality, and lower fertility. So education is advocated for those benefits. But investigators seldom pursue how people who achieve higher education might be different (e.g., in motivation, intelligence, work ethic, aspirations, social connections, and so forth) and thus confound the effect of education. Rather this entire Gordian knot of explanatory factors is often lumped together as years of schooling.

No single study design is a panacea. We must continue to use such observational methodologies. But we must implement them more carefully and interpret them more humbly.

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\*The views expressed are not necessarily those of USAID.

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## The Difficulties of Double Blinding

**THE RECENT PUBLICATION OF RESULTS FROM** the Women's Health Initiative (WHI) study of hormone replacement therapy (HRT) suggests that the health risks of taking HRT may outweigh the benefits ("The vanishing promises of hormone replacement," M. Enserink, *News Focus*, 19 July, p. 325). One interesting thing to note about HRT studies like the WHI is the strong possibility that the treatment and placebo groups can guess their assignments at a better than chance level. Beginning HRT can cause physical changes that may well be detected by women, such as a sudden reduction in hot flashes, an increase in vaginal lubrication, and mild acne. Women's guesses about their group assignment can affect their compliance with the program, as well as their choice of other treatments. It is possible that women who believe they are in the treatment group and expect HRT to help cardiovascular problems might be less likely to use the small doses of aspirin that are recommended to reduce clotting, while



**Recent findings about hormone replacement therapy have left patients and doctors shaken.**

others whose continuing symptoms suggest that they are in the placebo group may seek a variety of "natural" remedies for their symptoms such as soy products. A systematic effect is hard to predict, but we should keep in mind that a real double-blind design may not be possible here.

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## Science and Technology Centers and Education

**JEFFREY MERVIS'S DESCRIPTION OF THE** science and technology center (STC) program supported by the National Science Foundation (NSF) ("Science with an agenda: NSF expands centers program," *News Focus*, 26 July, p. 506) presents a view of the program that is not universally shared by all of the STCs. The nature of our mission, which is broad and includes not only research but also education and knowledge transfer, is demanding, but there are sufficient resources to make STCs a success. The nature of the support, up to \$20 million for 5 years, with a second 5-year period of funding, allows members of our STC and others to pursue cutting-edge research that is not only high-risk but whose payoff may be years away. In coupling this commitment to education and knowledge transfer, the STCs are able to explore a complete array of science-related activities.

The article also seems to portray K-12 education as an unwelcome burden placed on the STCs by the NSF. It is suggested that individuals who direct K-12 education efforts should be drawn from the scientist pool of the university—Ramon Lopez of the Center for Integrated Space Modeling is quoted as saying "It is a mistake to put an educator in charge."

On the contrary, at the inception of the Nanobiotechnology Center (NBTC), we

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