

2.7 Anal-Cranial Inversion

We were big Car Talk fans. (It was a call-in radio show on National Public Radio.) Imagine our delight when we heard a "puzzler" about diagnostic tests! If you don't want to read the banter between Tom and Ray Magliozzi, you can skip to **Question**.

Ray: Hi, we're back. You're listening to Car Talk with us, Click and Clack, the Tappet Brothers, and we're here to talk about cars, car repair, and the final Puzzler of the current Puzzler season.

Tom: So I should, like, savor this one? It's going to be a doozy, isn't it? A real season-ending splash.

Ray: Jerk. All right. There's a rare disease sweeping through your town ... and the disease is called ACI, and it produces irreversible anal-cranial inversion. You may have noticed that my brother has it. Now, of all people exposed to ACI, only 0.1 percent actually contract it. OK?

Tom: Point one percent.

Ray: A tenth of a percent. OK?

Tom: Zero point one percent.

Ray: And if you catch it early, before the symptoms present, you can get treatment and maybe you can be cured. Fortunately, there's a diagnostic test, which can detect ACI up to a year before the inversion occurs. So anyway, you go to your doctor and he administers the test, and it comes out positive.

Tom: Yeah?

Ray: And you say, "Oh, I'm done for." Then you're getting a little bit encouraged. You say, "Wait a minute, doc. Is this test 100 percent accurate?" And he says, "Well, not really, but it's 95 percent accurate."

Tom: Ninety-five percent accurate.

Ray: All right? He says, in other words, 5 percent of the people who take the test will test positive but they don't really have it. The question is: What are the chances that you will actually have an irreversible anal-cranial inversion?

Question: Assume sensitivity = 100%, specificity = 95%, and prior probability = 0.1%. What is the post-test probability after a positive test? (2 points: 1 pt for correct equation/approach, 1 pt for calculation)

