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Math solid on climate change, steroids in baseball

By JASON BROWN
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Barry Bonds arrives at a federal court in San Francisco in June 2006; Mark McGwire testifies at a March 2005 hearing on Capitol Hill on steroids in baseball and Roger Clemens testifies before a congressional committee in February 2008 on drug use in baseball. (THE ASSOCIATED PRESS / File)



JASON BROWN

Even when the TV goes out during a power failure, you can always go unplugged and pick up a newspaper (like this one).

In the wake of hurricane Earl, I caught up on the printed news. The sports section talked about the scandal that won't go away — steroids in baseball. Both Barry Bonds and Roger Clemens are up on perjury charges, among others, and we'll have to wait until the spring to see how that progresses. Likely, both players will be smaller by then.

And, of course, the "heat wave that was" only raises more questions about global warming.

As a mathematician, I am trained in MSI — math scene investigation. We mathematicians require evidence before believing. If I'm going to accept global warming or the use of steroids in baseball as fact, I need to be solidly convinced.

One of the great beauties of math is that it always aims not only to focus on specific problems, but to find the commonalities among seemingly different ones. So what do global warming and steroid usage have in common?

For both, I am looking for evidence that something has changed over time.

Let's consider global warming first. I know that certain things, like average yearly land temperatures, would randomly go up and down just by chance. If you look at the average yearly land temperature over, say, 10 consecutive years, then, provided that nothing was affecting the temperatures but chance, you would expect that the numbers would be completely independent from one another.

So the chance of any one particular year out of the 10 setting the record high temperature would be the same, namely one-tenth, or 0.1. There would be no reason to pick one year over the rest ahead of time to be the record setter.

How many record-breaking high temperatures should we expect among the 10? Well, the first year is certainly a record breaker, as there are no previous records. The second year is a record breaker just in case it is the bigger of the first two temperatures, and this happens one-half of the time. The third year is a record breaker a third of the time, just in case it has the highest temperature of the first three years, and so on.

The number of expected record-breaking high temperatures in the first 10 years would be

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WEEKLY SCIENCE

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the sum of all of these, which is $1 + 1/2 + 1/3 + \dots + 1/10$, about 2.9. That is, among 10 consecutive temperature readings, you would only expect three record-breaking years, just by chance.

I took a look at some data, available on the web, about the average yearly land temperatures from 1880 to 2001. In these 122 years, I counted 14 record breaking years for hot temperatures. I'd only expect by chance $1 + 1/2 + 1/3 + \dots + 1/122$, or about five records to be broken.

The 14 record breakers are way too high in comparison to the expected five. With a bit more math, I can even see that setting 14 or more records would happen less than 0.02 per cent of the time — really unlikely. So I have clear evidence that something is affecting the global temperature.

Likewise, I had a look at the total number of home runs hit in Major League Baseball since 1962, when the leagues fixed the schedule at 162 games. Ignoring the years shortened due to strikes and lockouts, I found 10 record-breaking years, when I should only expect about four by chance. Perhaps better conditioning is at play, or something more?

While I can't necessarily conclude what is causing the inordinate amount of record breaking in both cases, the evidence is strong that something is going on. I'm convinced. If enough of the public can be convinced by the math, then that might set a record, too.

Jason I. Brown is a professor of mathematics at Dalhousie University in Halifax. His research that used mathematics to uncover how the Beatles played the opening chord of A Hard Day's Night has garnered worldwide attention. He is also the author of Our Days Are Numbered: How Mathematics Orders Our Lives.

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