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# Citizen science often overstates ‘cancer clusters’ like the one linked to artificial turf

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The human brain does a great job of looking for potential threats. That’s a survival instinct. And in the general interest of making sense of the world, the brain is also good at looking for patterns. Those two tendencies sometimes prompt people to spot what look like unusual clusters of cancer or other illnesses in a small area or group of people and then come up with what seems to be the cause.

Unfortunately, the human brain is also really good at jumping to conclusions about patterns and threats and then stubbornly sticking to those conclusions and the fear they generate — even when more careful investigation reveals that the initial fears about a cluster are unfounded.

Communities across the United States are struggling with a glaring example of the corrosive problem of misguided citizen science right now as residents glance nervously at the artificial turf on their towns’ playing fields.

A few years ago, artificial turf and the rubber bits spread on it to cushion the impact when athletes fall were linked to cancer. The story began when Amy Griffin, a soccer coach in Washington state, noticed a cluster of cancer cases among soccer players, mostly female goalies, who had spent time playing and diving on artificial turf. Suspecting a link between artificial turf and cancer, she ultimately identified 53

soccer players, many of them goalies, with cancer. The cancer cluster she identified drew nationwide media attention[1] in 2014, which continues today.

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But that link hasn't held up. A careful investigation recently published[3] by Washington state public health officials found no link between artificial turf and cancer. The review compared the rate of cancer among the people on Griffin's list against the rate of cancer among all soccer players in Washington in the same age range. The numbers weren't even close. According to the report, "the number of cancer cases reported to us was about two percent of the number expected."

The investigators looked specifically at the kinds of cancer most frequently reported by Griffin — leukemia and non-Hodgkin and Hodgkin lymphoma — which are more common among younger people. There was no connection between artificial turf and these cancers. They specifically analyzed the risk for goalies, who made up a high percentage of the players on Griffin's list (she's a goalie coach). Again, no connection.

To see if something unusual might be going on in Washington state, the analysis compared statewide cancer rates among soccer playing kids against national rates. They were about the same. The investigators interviewed players on Griffin's list, who said that they actually spent most of their time, between 70 percent and 75 percent, playing on natural grass fields.

And, like any good scientists, the researchers reviewed other studies about this risk, to see how their one brick of evidence fit into the overall wall. Quite well — of 10 review papers that had taken a look at all the research out there, seven of them found no link between artificial turf and crumb rubber infill and cancer.

The conclusions of the report are unambiguous: "This investigation and available research do not suggest that playing soccer on artificial turf causes cancer. … This finding does not suggest that soccer players, select and premier soccer players, or goalkeepers in Washington are at increased risk for cancer compared to the general population."

The difference between Griffin's report and the one from the Washington state public health officials is that the latter took a much more careful look at the initial assumptions and the broader data.

Sadly, but not unsurprisingly, this reassuring finding has gotten far less attention in the media than the more alarming news about a cancer cluster among kids who play soccer on artificial turf.

Some parents of the kids on Griffin's list have criticized the new stud[6]y, as have environmental advocates[6] who ardently campaign against artificial turf (and industrial chemicals in general). Griffin also slammed the study[7], saying that investigators should not have focused only on her list, even though that list is what raised her initial concerns and fed the media coverage that spread those concerns across the nation. "My samples were extremely small and everyone knows it was anecdotal," she told a local reporter[6]. "There was nothing scientific about it."

What a perfect statement to capture the larger lesson this episode teaches. Citizen epidemiology can be tremendously valuable, but it is not science. It often lacks the careful critical analysis that can identify with more precision and certainty what the real threats actually are. Citizen science tends to be the product of the instinctive way we perceive the world in our fundamental and constant drive to avoid danger. It's a hint, a clue, and often an important first step, but it is not *the answer*.

Griffin identified a possible hazard and a pattern that seemed to make sense and that certainly warranted further investigation. In that regard, she follows in the footsteps of the pioneering citizen epidemiologist Anne Anderson in Woburn, Mass. Her suspicion about a pattern of childhood leukemia in her neighborhood led to scientific investigations that identified polluted drinking water as the cause. That work was portrayed in Jonathan Harr's book "A Civil Action" and the movie that followed. Or the observations of Michael and Linda Gillick of Toms River, N.J., whose suspicions drove rigorous research that identified polluted water as the cause of a cluster of illnesses in their town, documented in "Toms River," Dan Fagin's Pulitzer Prize-winning book on citizen epidemiology.

Most of the time, though, quick conclusions about disease clusters and their causes don't hold up to careful scrutiny. They are based on the leaps and assumptions we are programmed to make quickly and instinctively. They are a first reaction to the initial evidence, which must then be assessed using more careful critical thinking. That takes time and effort and open minds — not the default way the brain prefers to operate.

More rigorous evidence-based thinking will ultimately produce greater wisdom about what actually threatens us and how we can keep ourselves safe. But as examples like the artificial turf and cancer non-cluster illustrate, we have to work to overcome our instinctive knee-jerk cognition if we want to make more informed choices about our health and safety.

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