Numbers are just numbers, but how you grasp them fills in details

by Bend_Weekly_News_Sources

Presentation may be important to help people measure risks

Quickly now, which is a higher risk that you will get a disease: 1 in 100; 1 in 1,000; or 1 in 10? Choosing the correct answer depends on a person's numeracy - the ability to grasp and use math and probability concepts, according to a presentation at the annual meeting of the American Association for the Advancement of Science.

The scenario was part of a series of experiments with University of Oregon students. In this case, 96 percent correctly chose 1 in 10, a 10 percent chance. However, that response came from a more-educated, college-going crowd. The numbers of correct answers fell significantly when put before less educated and older Americans, said Ellen Peters, a UO courtesy professor of psychology and senior research scientist with Decision Research, a non-profit research institute in Eugene, Ore.

"It's interesting that many people can't get simple questions like this, but what I'm really interested in is: Does it matter to decision making, such as choosing medical options, picking stock or mutual funds?" Peters said. "It turns out, yes, it does. In risk communication, you can talk about a 1 percent chance of disease or a 1 chance out of 100. Logically, those two presentations are equivalent, but they elicit different risk perceptions depending on your number ability."

To help people better comprehend numbers and assess certain risks, presentation may be vital, Peters said. The National Adult Literacy Survey, she noted, found that 47 percent of Americans don't have minimal math skills necessary to use numbers imbedded in printed materials.

"It's not that low numerate people are stupid," Peters said. "It's just that high numerate people transform numbers better. A lot of decisions involve numbers. It turns out that how good you are with numbers influences not only whether you understand them, which is how we traditionally think about math abilities, but

it influences how we process the information into decisions."

An example, she said, involves two jars of jelly beans. A large jar holds nine colored beans among 100; a smaller jar contains 10 beans with one colored. Choosing a colored bean means you win a prize. If given one chance, from which jar would you prefer to draw? Low numerate people, Peters said, are more likely to be drawn by emotional factors and draw from the larger bowl simply because they see more winning beans. High numerate people, however, see the big picture and draw affective meaning from a comparison of probabilities: nine in 100 is 9 percent, whereas 1 in 10 is 10 percent, therefore they have "and feel they have" a better chance going for the smaller jar.

To show the impact of numbers in risk perception, Peters told students that a patient, Mr. Jones, had been evaluated by a respected psychologist for discharge into the community. One group of students learned that of every 100 similar patients, 10 percent would likely commit violence. The second group was told that for every 100 such people, 10 were likely to do so.

High numerate students saw risks as equal, Peters said. "Low numerate people didn't see as much risk for Mr. Jones' potential for violence if told only that there is a 10 percent chance. We found that when low numerate people were told instead that there was a 10-in-100 chance, they could picture 10 people running around going crazy and realized that Mr. Jones may be one of them."

In another experiment, Peters showed two charts, one a commonly used Adjuvant Decision Aid that helps women choose which therapy to accept, if any, after breast-cancer treatment. The other chart was a simplified version. Subjects were asked to study the charts and recommend a therapy.

The Adjuvant Decision Aid features cluttered bar graphs and shows that 70 of every 100 women are alive in 10 years after choosing no additional therapy, that 23 died because of cancer and another seven died of other causes. The chart also shows the impacts of chemotherapy alone, hormonal therapy alone and combined therapy. The simplified chart shows four bars, clearly showing that 70 of 100 women are alive after 10 years with no therapy; 74 of 100 are alive after chemotherapy, 76 are alive after hormonal therapy, and 79 of 100 are alive after combined therapy.

After viewing the standard chart, 44 percent of subjects, regardless of numeracy, chose no additional therapy. Subjects viewing the simplified chart had a different take. Only 4 percent of low numeracy subjects chose no more therapy, while 6 percent with higher math abilities agreed.

"Numeracy and format interact in comprehension," Peters said. "With adjuvant, people with lower numeracy understand much less of the information, but even people high in ability didn't do that great. With the improved format, everybody got better in comprehension almost equally, which means the low numerate subjects were helped the most."

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