**The Real Bottom Line of the ‘Bad Luck’ Cancer Study**

**By Elizabeth Mendes January 9, 2015**

**A study published in the journal Science last week concluded that the “majority” of the difference in the chance a certain tissue will turn cancerous may be due to random mutations that occur through normal cell replication. This finding has spurred a large number of news headlines suggesting that “most” cancers are the result of “bad luck.”**

**The bottom line of this study, however, is not so extreme.**

**In fact, the authors themselves – Johns Hopkins University School of Medicine researchers Cristian Tomasetti and Bert Vogelstein, MD, (recipient of an American Cancer Society Research Professor grant) – have clarified their finding. “Actually, our paper does not allow an estimate of the number of cancers that are preventable,” Dr. Vogelstein told the American Cancer Society in an email.**

**In undertaking the study, the authors were seeking to explain a long-known phenomenon. They wanted to understand why certain types of body tissues are more likely to give rise to cancer than other types. For example, as the authors note, the lifetime risk of being diagnosed with lung cancer is 6.9%, but for brain cancer, it is 0.6%.**

**Some of the difference is due to well-known risk factors, such as smoking and exposure to ultraviolet light, they explain. But the researchers wanted to figure out the cause of cancers that are as yet not tied to any environmental or hereditary issues.**

**To do this, they analyzed stem cells, the type of cells that are most likely to lead to the start of cancer. They looked at stem cells from 31 types of body tissues. They were not able to include all tissue types, having to leave out many common cancers, including breast and prostate cancer, in their analysis.**

**Using existing data, the researchers used a mathematical model to determine the correlation between the lifetime risk of cancer developing for each tissue type and the total number of times the stem cells in each tissue type divide during the average human lifespan.**

**Their analysis uncovered a strong correlation between these two variables, meaning that in the tissue types they analyzed, the more stem cells divide, the greater the chance of a cancer-causing mutation to occur. The researchers sought to quantify this relationship and determined that “65% of the differences in cancer risk among different tissues can be explained by the total number of stem cell divisions in those tissues.”**

**The 65% is a statistical estimate. The margin of error could put that figure anywhere from 39% to 81%. Based on this, they concluded that the random effects of cell division “contribute in a substantial way to human cancer incidence in the United States.”**

**The Bottom Line**

**The study’s findings are “consistent with much of what we believe about how cancer develops,” says Elizabeth Ward, Ph.D., National Vice President of Intramural Research for the American Cancer Society. Cancer development is “a multistep process in which environmental and genetic factors, as well as random events, may all play a role in transformation from a normal cell to a cancer cell to an invasive cancer,” says Ward.**

**Ward explains that the more times a cell divides, the more likely it is to have a random error in DNA replication resulting in a cancer-causing mutation, or to have a cancer-causing mutation resulting from environmental exposures passed down to daughter cells. “The study confirms this,” says Ward.**

**“The study does not provide any new information about the proportion of cancers that are preventable, the relative importance of prevention for specific cancers and the relative importance of prevention to other cancer research and control priorities,” says Ward.**