Lifestyle, Cancer and Luck

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We are taught in popular culture to believe that cancer in its various forms is very often lifestyle-caused. Have melanoma? Why didn't you stay out of the sun? Have lung cancer? Why did you smoke? To be sure, some cancers do not fit this pattern as strongly, but there were still often lifestyle links: smoking is believed to be a strong risk factor for pancreatic cancer, for example. Other cancers appear to be hereditary, though the calculation there is more difficult: the BRCA1/2 mutation produces a 40-60% lifetime risk of breast cancer (and a much higher risk of ovarian cancer), but it turns out to account for only about 5% of breast cancers. The BRCA mutation made national headlines when Angelina Jolie tested positive for it and elected to have a prophylactic double mastectomy.

The connection between the lifestyle-hereditary explanations for cancer is that both can give people specific things to do that will minimize their risk. We have organized a lot of our health policy around these injunctions: stop smoking, drink less, consider prophylactic surgery if you are a BRCA carrier. They thus contribute to a very popular narrative according to which our current and future health are investments: make the right lifestyle choices now, and see good returns in the future. Thus, the right kinds of self-discipline can ensure that we maximize our health outcomes.

One immediate problem with this narrative is that it transfers the burden of disease risk onto individuals who may not be in any position to avoid it. For example, the residents of St. John the Baptist Parish in Louisiana suffer staggering rates of cancer and other health problems, almost certainly due to the proximity of a neoprene chemical plant. These residents, however, are nearly all there because of the accident of their birth into poverty. Asking them to leave is asking them to do something they cannot plausibly do. Similarly, blaming smokers for smoking requires ignoring not just the addictive effects of nicotine, but the advertising budget of the tobacco industry, its ability to target younger smokers, and its longtime historical concealment of the connection between smoking and disease risk. Blaming the obese for their condition ignores the many structural factors over which they have comparatively little control, including the ready availability of expensively marketed, calorically-dense but nutritionally sparse foods.

These challenges to the narrative are all social justice issues. But what if, in addition, there were more epistemic ones? What if the lifestyle paradigm radically over-estimates the incidence of cancers caused by lifestyle factors? We have known for a while that cancer incidence is higher in the elderly, which suggests precisely what a pair of recent studies published in *Science* claim: that a substantial percentage – perhaps as high as 65% - of the variation in cancer risk between different tissues can be explained by the number of stem cell replications in that

tissue. More replications means more chances for mutation, which is to say that more replications means greater odds of "bad luck" striking. The studies are controversial, and certainly do not say, as was widely reported, that up to two-thirds of cancers are caused by bad luck. But they do say something uncomfortable to the lifestyle theory of cancer risk, which is that we simply do not know enough to know how much of cancer risk is attributable to either hereditary or environmental factors, as opposed to "bad luck."

As a companion piece published with the second study implies, we need to approach the etiology of cancers with a certain epistemic humility. Picking up on a point made in the original studies, the piece considers a case in which a several mutations are individually necessary and jointly sufficient to initiate cancer in a given tissue. If only one of them were environmentally induced, then avoiding that environmental trigger would be sufficient to avoid the cancer. But the logic of the example works in several directions. Suppose that there were three necessary mutations: one "bad luck," and two environmental (say, smoking). In that case, we would likely advise that individuals not smoke, pointing out that although many smokers never get cancer (the "bad luck" mutation never occurs), their risk is enormously elevated. But what if there were six necessary mutations, only one of which was lifestyle? Would we recommend avoiding the lifestyle trigger then? After all, a patient would have to have a lot of "bad luck" in the statistical sense for the lifestyle trigger to result in cancer.

Presumably, the difficulty in avoiding the lifestyle trigger would be part of any answer to that question. But here, social justice issues raise their head again: who bears the cost of avoidance, and how much cost should individuals versus larger entities be asked to bear? In the case of the Louisiana town, if the cost to its citizens of avoiding pollution is too high, then what cost might the neoprene factory be reasonably asked to bear? To put the point in deliberately uncomfortable terms: since we are dealing with a population, how many predictable deaths are sufficient to justify a given amount of investment in avoiding an environmental/lifestyle trigger? And, given that we don't know the exact proportions of environment, heredity and bad luck, how do we make such a decision?

I don't have answers to these questions, but I do think they suggest a couple of things. First, any discussion of cancers and their prevention needs to be approached with both a sense of epistemic humility and moral salience. Lifestyle-based approaches to cancer assume that we know a lot about the role of environmental factors, and they tend to assign too much responsibility to individuals for avoiding those factors. Second, we need to be very careful in deciding when to call it an individual responsibility to avoid certain environments or behaviors. This is not just because of social justice issues. It is also because we don't really understand the etiology of most cancers well-enough to know when or how much to nudge peoples' behaviors.