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Perspectives

Universal Health Care and the Cost of Being Human

Roger Strair

ABSTRACT

In this article I argue that the biological processes that make us human have error rates that distribute illness on a no-fault basis. I propose this as an ethical foundation for universal healthcare.

The United States Affordable Care Act was, in part, designed to increase the number of residents who have health insurance. Subsidies were provided for many who do not have workplace insurance benefits, and insurers must accept clients independent of their health status. In many states, Medicaid was expanded, and Medicare reforms that were designed to change careproviders' reimbursement were also instituted. It was estimated that nearly ten million previously uninsured people in the U.S. would have coverage. Nevertheless, high co-payments and deductibles limit access to healthcare, even amongst those with higher end healthcare insurance. Despite this advance towards more accessible universal healthcare, there were still many patients who were either uninsured or underinsured. What is the ethical obligation to those without adequate insurance? The answer may lie in our biology, encoded in our DNA.

We are a dynamic species, the product of hundreds of thousands of years of evolutionary response to threats. We have a remarkable capacity to deal with danger. However, to be human and dynamic, we must each copy so much DNA and respond so rapidly to threats that random, no-fault errors occur. There is only so much one can do error-free, and we must exceed those limits to survive. These errors are the price of our complexity and adaptability. Occasionally they result in disease.

Consider just our blood. It is composed of many different types of cells: red blood cells that carry oxygen, white blood cells of several types that coordinate a refined defense against infection, and platelets that prevent bleeding. Each of these cell types engages also in other complex interactive physiologic processes. Blood cells are produced in the bone marrow. We must make 500 billion (5×10^{11}) new blood cells each day to survive. The DNA in each cell contains 3×10^{9} bits of information (nucleotides). A lot of DNA to be copied in a short period of time! We need so many cells so fast that we must compromise quality for quantity. It is chemically impossible to accomplish this task at 100 percent efficiency. Errors in copying DNA occur at a rate of 10^{-8} to10^{-10} at each nucleotide in each cell during DNA replication.[1] These mistakes occur in all of us,

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as they are the embedded foundation and consequence of evolution. Given the number of blood cells that must be made every day, there are tens of millions of bone marrow genetic mutations per second occurring in each of us. In the U.S. (population 322 million), 3.2×10^{15} mutations are estimated to occur in bone marrow per second.

Making so many cells requires an immense biochemical burden that, by the restrictions of chemical reactivity, cannot be perfect. Mistakes abound: to be perfect would require us to be too slow to survive. To perfect the system and free it of mistakes would deprive us of flexibility and leave us as losers in the evolutionary battle. Lewis Thomas wrote: "The capacity to blunder slightly is the real marvel of DNA. Without this special attribute, we would still be anaerobic bacteria and there would be no music." Without these errors, we would not be human and we could not survive.

We almost always bear these DNA (genetic) errors without problem because they occur at a low rate per cell division (~three changes in three billion bits of information) and we have adapted a philosophy of survival. Any single cell gone bad can do harm, but no single cell is essential, so we have mechanisms to get rid of nearly any cell that has even a hint of a problem. However, on rare occasions, the "monkey at the typewriter"-type random changes in the bone marrow cell can result in significant changes that result in the development of a blood cell cancer (leukemia, lymphoma, Hodgkin lymphoma, multiple myeloma, and related diseases), an equally distributed no-fault side-effect of being human.[2]

What's true in the bone marrow for blood-related cancers is true in all tissues. Without the error rates that result in someone getting cancer, we could not replicate enough DNA to carry out the physiologic processes of humanity, and we would all die. Evolution has treated us as a species and spared almost all of us by sharing the risk. The process of disease is a mandatory by product of biological success. It is insurance for our species.

The same is true of many diseases. Even some behavioral diseases evolve in the context of social stresses that are adaptive and evolutionary.[3] Our success and evolution as a society may be dependent also upon processes that benefit most, but cause problems for others. For example, psychopathic traits may necessarily evolve to facilitate the leadership and the high-risk occupational experts necessary for group survival, but psychopathy may also foster antisocial and criminal behavior.[4] Hence, adaptive changes may result in neuropsychological changes or behaviors that may be labeled or perceived as illness. As DNA must blunder, so must we.

So there are many lessons from illness. Perhaps nearly all disease occurs as a consequence of the biological and sociologic processes that make us human. Pollution, smoking, addiction, unhealthy diets, and other factors that adversely affect our health may arise in part as the consequence of cultural, social, and biologic evolutionary forces outside the control of the individual. We are linked by the interrelatedness of our endogenous and exogenous life-sustaining processes, and the risks inherent in these processes are shared amongst all humans. They are essential for all, but result in illness for some.

These biological facts may inform our perspectives on the justice of healthcare. At a mandatory 3.2×10^{15} species-sustaining mutations occurring in just the bone marrow per second in the U.S., some people will get sick. Some people will be randomly forced to assume the inevitable burden of illness/disease. When viewed from a Rawlsian impartial distribution of goods, we are invited to an "original position" behind a "veil of ignorance" that denies us knowledge of our own biases, status, and character.[5] In this state of fairness, many would feel that we must care for those biologic martyrs who drew the bad "hand" of illness. It is the natural response to the shared egalitarian risk of being human. In this setting, we must develop a healthcare system that better fits our needs and condition as a species.

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NOTES

1. A. Kondrashov, "Genetics: The Rate of Human Mutation," *Nature* 488, no. 7412 (2012): 467-8; A. Kong et al., "Rate of de novo Mutations and the Importance of Father's Age to Disease Risk," *Nature* 488, no. 7412 (2012): 471-5.

2. P.A. Blombery, M. Wall, and J.F. Seymour, "The Molecular Pathogenesis of B-cell non-Hodgkin Lymphoma," *European Journal of Haematology* 95, no. 4 (2015): 280-93.

3. S. Cohen, D. Janicki-Deverts, and G.E. Miller, "Psychological Stress and Disease," *Journal of the American Medical Association* 298, no. 14 (2007): 1685-7; J.C. Phelan, B.G. Link, and P. Tehranifar, "Social Conditions as Fundamental Causes of Health Inequalities: Theory, Evidence,

and Policy Implications," *Journal of Health and Social Behavior* 51, suppl. (2010): S28-40.

4. S.O. Lilienfeld, R.D. Latzman, A.L. Watts, S.F. Smith, and K. Dutton, "Correlates of Psychopathic Personality Traits in Everyday Life: Results from a Large Community Survey," *Frontiers in Psychology* 5 (2014): 740.

5. J.C. Moskop, "Rawlsian Justice and a Human Right to Health Care," *Journal of Medicine and Philosophy* 8, no. 4 (1983): 329-38.