

Prospective Medicine Defeats Diseases by 2039

Forecasts:

- **By 2039, prospective medicine has thwarted the clinical manifestations of cardiovascular disease and diabetes.**
- **Aggressive society-wide preventive measures have limited obesity to 38% of adults, one-third less than forecast in 2008.**

In 2039 “prospective medicine” is widely available. Advanced genetic, proteomic, and metabolomic profile testing, conducted at specified stages of life, inexpensively forecasts an individual’s lifetime disease risk. This risk forecast allows patients and their health network to create a plan for behavioral changes and the use of targeted chemopreventive drugs. Periodic monitoring lets them detect these predicted diseases during a “pre-disease” state when early intervention may prevent the onset of symptoms.

Most diseases evolve over a period of years through an accumulation of perturbations in genetic and metabolic pathways within cells, finally resulting in symptomatic disease. Biomonitoring tests detect these subtle abnormalities so that targeted therapies can nudge the cell back to normalcy. As a result, some diseases which were once common now rarely occur. Every year new breakthroughs prevent more disease subsets from developing. Clinical success requires sophisticated tests, targeted therapies and diligence and continuity on the part of the health home team of care providers.

Prospective medicine also requires commitment and motivation on the part of the patient, a factor first driven by employer initiatives in the first decade of the early 21st century. A Duke University study in 2008 showed that its severely obese employees filed twice as many workers’ compensation claims, had seven times higher medical costs, and lost 13 times as many days from work. Other studies showed that even 30 minutes of walking five times per week, a healthy diet, not smoking and maintaining a healthy weight could reduce cancer risk by 60%, diabetes by 90% and heart diseases by 80%. Yet only 4% of American adults in 2008 achieved these four critical health elements. To improve performance and reduce healthcare costs, employers began implementing health assessment, intervention and incentive programs to help employees to make dramatic improvements in their lifestyle.

A healthy lifestyle is essential to a healthy society. Yet in 2015, 41% of Americans were obese, and this number was projected to rise to 58% by 2040. In 2039, however, only 38% are obese as a result of a shared responsibility for dramatic changes in living.

Research in the emerging field of “epigenetics” showed that environmental factors can cause gene expression to be turned “on” or “off.” Furthermore, these epigenetic changes in gene expression can be passed on to future generations. For example, an obese woman is more likely to have an obese child due to the mother’s humeral and metabolic environment during pregnancy. Poor diet and limited exercise during early childhood can also turn on or off the expression of genes critical to normal childhood development and metabolism. That these epigenetic changes can be passed on to subsequent generations compounds the obesity problem.

Epigenetic research explained how societal and environmental influences, among them diet and lifestyle, lead to specific diseases. Pilot projects confirmed that specific changes in behavior would make a critical difference in preventing obesity, cardiovascular disease and many cancers. New medications were developed to block certain epigenetic changes, but they tended to block essential functions as well. Therefore, society realized that it needed to focus on lifestyle changes as a way to “design disease out of society.”

In the 2010’s, the National Institutes of Health took the initiative in devising methods to change people’s behavior. Despite the implementation of these new methods, obesity remained a stubborn problem. It soon became obvious that individual and parental responsibility were not sufficient given the “obesogenic” environment of society as a whole.

Analysis confirmed that all elements of society have a role to play in promoting healthy lifestyles. Schools focused on serving healthy meals, teaching about health, removing high-calorie snacks from vending machines and bringing back daily physical education. Communities redesigned their built environments so that people could safely walk to schools, offices and shopping centers and enjoy safe physical activity during leisure time. Leaders worked with restaurants and grocery stores to provide healthy food in appropriate serving sizes at prices all Americans could afford. Awards were given to families that made lifestyle changes and achieved specific health targets. Employers introduced physical activity into the workday of otherwise sedentary knowledge workers. A massive education campaign led many people to embrace daily physical activity and healthy living. Overcoming significant resistance, a progressive “bad calorie” tax finally forced food companies to preferentially produce healthy foods in appropriate portions.

At the same time, policymakers realized that disparities in access to education, jobs, housing and financial security were significant barriers to health for many people. Leaders at both the national and community levels reengineered society to achieve social justice, gradually eliminating health disparities.

Comprehensive behavioral change is now the mainstay of prospective medicine. When required, personalized therapeutics nudge cellular pathways back to normalcy to prevent disease. By 2039, America leads the world in being a healthy and competitive society. It has also turned the corner where lifelong health costs per individual are decreasing in spite of accelerated longevity growth.

Further Reading:

- Young, E., “Rewriting Darwin: The new non-genetic inheritance,” *New Scientist*, July 9, 2008.
- Snyderman, R., Williams, R.S., “Prospective medicine: the next health care,” *Acad Med* 2003; 78:1079-84.
- Gearon C.J., “Firms Offer Payouts to Those Who Work Out,” *Washington Post*, October 14, 2008, HE01.
- Institute for Alternative Futures, *Diabetes Forecasts to 2025 and Beyond: The Looming Crisis Demands Change* www.altfutures.com/foresight/IAF%20Diabetes%20Looming%20Crisis%20Forecasts%20Nov%202005.pdf