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Economic return from Human Genome Project grows

Report finds genomics effort has added US$1 trillion to US economy.

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The financial benefit of the project to decode the human genome continues to grow, according to a controversial report released today by the Battelle Memorial Institute. A decade after the project ended, the benefit now hovers near US$1 trillion.

The Human Genome Project, an international effort led by the United States that ran from 1988 to 2003, has delivered $178 to the US economy for every public dollar spent on the original sequencing, the report says. That is 26% greater than the $141 return-per-dollar that Battelle, a research contractor based in Columbus, Ohio, had calculated in 2011, in its first attempt to estimate the scientific effort's financial reach.

"The economic impacts generated by the sequencing of the human genome are large, widespread and continue to grow," says Martin Grueber, the primary author of the report and a research leader in Battelle's technology partnership practice.

Francis Collins, director of the US National Institutes of Health in Bethesda, Maryland, the organization that spearheaded the genome project, used the report to argue against reductions in federal research spending. "Now is not the time to cut back on biomedical research, when the evidence proves this is such a profoundly important investment in America's future," he says.

But economists who were not involved in the study say that its numbers are not credible. Critics add that its basic approach is flawed, because it quantifies the economic activity generated by the Human Genome Project instead of its impact on human health, which can be judged by metrics such as patient outcomes and production of drugs and diagnostics.

Robert Topel, an economist at the University of Chicago Booth School of Business in Illinois, says that the benefits of health research are not measured in effect on gross domestic product, productivity or jobs. "The question is: what health benefits have people got out of it, and what will they get in the future?" he says.

Number crunching

In its original study, Battelle calculated the genome project's financial impact on the US economy until the end of 2010. The report used an 'input–output' economic analysis to gauge the output, both direct and indirect, generated by the project through genomics-related businesses and university research. The input was the government's initial spending on the project; included in the output were the value of goods produced, income taxes paid and personal income generated.

The latest study, which examines data until 2012, goes a step further. In addition to calculating the benefits per dollar originally invested by the government — $5.4 billion in 2012 dollars — it estimates how the bang-for-buck changes if the input value also includes the $9.1 billion that the government has spent on related genomics research since the mapping effort ended. Using the combined investment value of $14.5 billion, Battelle calculates a 65-fold return ($65 for every $1).

But other studies, although not strictly focused on the economic impact of genomics, have reached more modest conclusions. A broad-based 2009 analysis[1] by researchers affiliated with the non-profit National Bureau of Economic Research in Cambridge, Massachusetts, suggested returns of just $2.50–$3 for every dollar spent on research and development.

Julia Lane, who until last year directed the science of science and innovation policy programme at the US National Science Foundation in Arlington, Virginia, calls the Battelle report's numbers "ridiculous". Lane, now the senior managing economist at the American Institutes for Research in Washington DC, says that the analysis "reinforces this notion that science is a slot machine that you put money in, and magic happens and money pops out at the end".

She notes, for instance, that to define which industry activities fall under the genomics sector, Battelle used data from a firm that gathers company information for credit-rating purposes — Dun and Bradstreet, headquartered in Short Hills, New Jersey — instead of using the much more rigorous industry codes developed by the US Census Bureau. Similarly, Lane adds that Battelle used "less than

robust" employment data from Dun and Bradstreet, rather than high-quality numbers from the US Bureau of Labor Statistics.

Other factors

Physician and economist Mark McClellan, who is director of the Engelberg Center for Health Care Reform at the Brookings Institution in Washington DC, says that the government's investment cannot account for all the growth in the genomics sector. "Many other factors, including private investment and innovation, have also contributed to the subsequent growth in clinical and practical applications of genomics," he says.

But Simon Tripp, a senior director in Battelle's technology partnership practice, vigorously defended the latest report. He says that its methods represent "the gold standard for impact analysis". Tripp adds that the report may even underestimate the total economic impact of the Human Genome Project on the US genetics and genomics industry, because it focuses solely on human applications.

Bruce Weinberg, an economist at Ohio State University in Columbus who was not involved with the study, agrees that Battelle has used a very standard approach. "It's not that they somehow veered off the rails," he says. Still, he adds: "The reality here is we are not really measuring what we want to measure. Not: 'how many jobs were created?', but 'how many lives were saved?'"

Topel likens Battelle's approach to the argument that military spending is worthwhile because it keeps many people employed building ships and planes, or serving in uniform. In fact, those people could be engaged in other pursuits, and should be counted as costs, rather than benefits, of military spending, he says. The true benefit of such spending, Topel adds, is increased security — which, like improved health, is much harder to measure.

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References

1. Hall, B. H., Mairesse, J. & Mohnen, P. NBER Working Paper No. 15622 available at: http://www.nber.org/papers/w15622 (2009).