

The Economic Impact and Application of Human Genetics and Genomics

Report demonstrates that human genetics and genomics is fundamental for biomedical research, widely deployed in healthcare, and boosts the U.S. economy.

This project describes the positive impacts for the economy, society, and individual health that are derived from modern human genetics and genomics science and its associated commercial and clinical applications. These highlights are from a new report by ASHG and TEconomy Partners.

Twenty years after the completion of the Human Genome Project, there has been widespread expansion of human genetics and genomics technology and its application universe. Technologies for sequencing and for genome analysis have advanced quite spectacularly – to the extent that genome sequencing is quite affordable, and an entire genome may be sequenced in less than a day. Today, this expansion has brought human genetics and genomics to a visible inflection point. The speed and affordability of gene sequencing and advanced genomic data analytics have helped produce deep biomedical insights and innovations, which are being combined with advancing biopharmaceutical, diagnostics, and other medical technologies that can leverage genomic information. The result is that genomics is now part of the everyday clinical practice of medicine across many medical specializations and medical conditions.

Economic Impact Highlights



 **\$3.3B**
FEDERAL RESEARCH

Federal research funding, using a conservative definition of what constitutes human genetics and genomics research, reached \$3.3 billion in 2019, with most of this coming from NIH.

 **152,000**
INDUSTRY JOBS

89,464 core private sector industry jobs and an estimated 62,710 additional extended industry jobs (related employment share from major pharmaceutical and medical testing/diagnostics companies).

 **850,000**
TOTAL SUPPORTED JOBS

With a direct employment estimate of nearly 166,000 academic and industry jobs, human genetics and genomics supports more than 850,000 total jobs. Each direct human genetics and genomics job supports 4.12 additional jobs in the U.S. economy.

 **\$265B**
TOTAL ECONOMIC IMPACT

The direct economic activity generated by the human genetics and genomics industry exceeds \$108 billion in 2019 and ultimately supports a total of more than \$265 billion across the U.S. economy. Every \$1.00 of direct human genetics and genomics activity generates an additional \$1.45 in the U.S. economy.

 **\$5.2B**
DIRECT FEDERAL TAX REVENUES

The federal tax revenues of \$5.2 billion generated by the direct operations of the human genetics and genomics domain alone, surpasses the single year federal investment in human genetics and genomics of approximately \$3.3 billion across all federal agencies.

 **4.75:1.00**
FEDERAL RETURN ON INVESTMENT

In the simplest of terms, from a federal investment and revenue perspective, the overall economic impacts of U.S. human genetics and genomics generates a return on investment (ROI) of more than 4.75 to 1.00 (\$3.3 billion in federal investment in human genetics and genomics – while the whole domain generates \$15.5 billion in federal tax revenues).

Functional Impact Highlights

Genomics has become fundamental to advancement of biomedical research, and the insights, tools, and technologies provided by genetics and genomics are now widely deployed in clinical healthcare. These functional applications are divided into eight medical domains as shown in the figure below.

Current Functional Impact Domains (Applications) of Human Genetics and Genomics



In addition to applications to human medicine, there are additional non-medical applications for human genetics and genomics including in forensic science, anthropology, genealogy, evolutionary biology, and paternity testing.

Whether for medical or non-medical applications, it is evident that human genetics and genomics advancements provide extremely large-scale benefits across a broad variety of functional impact domains. Genetics and genomics are considered fundamental within modern biological science, providing answers to basic biological research questions, and they underpin a diverse range of applied innovations and applications that are greatly enhancing human health and well-being.