Short-Read Sequencing Market - Global Industry Size, Share, Trends, Opportunity, and Forecast, 2019-2029 Segmented By Product (Instruments, Consumables, Services), By Application (Whole Genome Sequencing, Whole Exome Sequencing, Targeted Sequencing & Resequencing, Others), By End User (Academic & Research Institutes, Hospitals & Clinics, Pharmaceutical & Biotechnology Companies, Others), By Region and Competition

Market Report | 2024-02-19 | 170 pages | TechSci Research

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Report description:

Global Short-Read Sequencing Market was valued at USD 5.42 Billion in 2023 and is anticipated to project robust growth in the forecast period with a CAGR of 13.89% through 2029. Short read sequencing, also known as next-generation sequencing (NGS), has revolutionized genomic research and clinical diagnostics due to its high throughput, speed, and cost-effectiveness. This market encompasses a wide array of technologies, platforms, and services aimed at deciphering DNA and RNA sequences quickly and accurately. Key players in this market include Illumina, Thermo Fisher Scientific, Oxford Nanopore Technologies, and Pacific Biosciences, among others, each offering innovative sequencing solutions tailored to various research and clinical applications. The market is primarily driven by the increasing demand for personalized medicine, advancements in genomic research, and the rising prevalence of genetic disorders and cancers worldwide. Short read sequencing finds extensive applications in fields such as oncology, infectious diseases, reproductive health, agriculture, and forensics, driving its adoption across academic research institutions, pharmaceutical companies, clinical laboratories, and biotechnology firms.
Moreover, technological advancements such as improved sequencing chemistries, enhanced bioinformatics tools, and the development of portable and benchtop sequencers are further fueling market growth, enabling broader accessibility and scalability of sequencing solutions. However, challenges such as data analysis complexities, standardization of protocols, and

ethical considerations surrounding genomic data privacy and consent remain significant hurdles in the widespread adoption of short read sequencing technologies. Nonetheless, collaborations between industry players, academic institutions, and regulatory bodies are fostering innovation and addressing these challenges, thereby propelling the growth of the global short read sequencing market.

Key Market Drivers

Advancements in Genomic Research

Advancements in genomic research have been instrumental in driving the growth of the Global Short Read Sequencing Market. The field of genomics has undergone a remarkable transformation in recent years, fueled by technological innovations and a deeper understanding of the genetic basis of diseases. Short read sequencing, also known as next-generation sequencing (NGS), lies at the forefront of this revolution, offering unprecedented capabilities for deciphering DNA and RNA sequences with high throughput and accuracy.

One of the keyways in which advancements in genomic research boost the short read sequencing market is by increasing the demand for sequencing technologies. As researchers delve deeper into the complexities of the human genome and its role in health and disease, there is a growing need for high-throughput sequencing platforms that can efficiently analyze large volumes of genetic data. Short read sequencing technologies fulfill this need by providing rapid and cost-effective solutions for genome-wide analysis, enabling researchers to explore diverse research questions and hypotheses.

Moreover, advancements in genomic research have led to the identification of novel genetic markers, biomarkers, and therapeutic targets, further driving the adoption of short read sequencing technologies. By sequencing the genomes of individuals with different diseases or phenotypes, researchers can pinpoint genetic variations associated with specific traits or conditions. This information is invaluable for understanding disease mechanisms, identifying potential drug targets, and developing personalized treatment strategies. As the demand for precision medicine continues to grow, so does the demand for short read sequencing technologies that can facilitate genomic profiling and molecular diagnostics.

Furthermore, advancements in genomic research are driving innovation in sequencing technologies themselves. Researchers and industry players are constantly pushing the boundaries of sequencing technology, developing new chemistries, instrumentation, and bioinformatics tools to enhance sequencing performance and capabilities. These innovations not only improve the accuracy and efficiency of short read sequencing but also reduce costs and increase accessibility, making sequencing technologies more widely available to researchers and clinicians around the world.

Rising Prevalence of Genetic Disorders and Cancers

The rising prevalence of genetic disorders and cancers worldwide is significantly boosting the Global Short Read Sequencing Market. Genetic disorders, characterized by abnormalities in an individual's DNA, encompass a wide range of conditions, including rare genetic diseases, hereditary disorders, and chromosomal abnormalities. Similarly, cancer, a complex genetic disease characterized by uncontrolled cell growth, is a leading cause of morbidity and mortality globally. As the incidence of genetic disorders and cancers continues to rise, there is an increasing demand for accurate and comprehensive genomic analysis, driving the adoption of short read sequencing technologies.

Short read sequencing plays a critical role in the diagnosis, prognosis, and treatment of genetic disorders and cancers by enabling high-throughput analysis of DNA and RNA sequences. By sequencing the genomes or transcriptomes of patients, researchers and clinicians can identify genetic mutations, structural variants, and gene expression patterns associated with specific diseases or cancer subtypes. This information is invaluable for understanding disease mechanisms, predicting disease progression, and guiding personalized treatment strategies tailored to individual patients.

Moreover, short read sequencing technologies facilitate the identification of actionable mutations and therapeutic targets, paving the way for precision medicine approaches in the management of genetic disorders and cancers. By matching patients with targeted therapies or clinical trials based on their genomic profiles, short read sequencing technologies can improve treatment outcomes and reduce adverse effects. Additionally, sequencing technologies enable the monitoring of disease progression and treatment response over time, allowing clinicians to adjust treatment regimens as needed.

The rising prevalence of genetic disorders and cancers also underscores the importance of early detection and prevention strategies, further driving the demand for short read sequencing technologies. By screening individuals for genetic predispositions or risk factors associated with certain diseases, sequencing technologies can identify at-risk populations and facilitate early

intervention or preventive measures. For example, carrier screening using short read sequencing can identify individuals at risk of passing on genetic disorders to their offspring, enabling informed reproductive decisions.

Technological Advancements in Sequencing Platforms

Technological advancements in sequencing platforms are playing a pivotal role in boosting the Global Short Read Sequencing Market. Short read sequencing, also known as next-generation sequencing (NGS), has undergone rapid evolution, driven by innovations in instrumentation, chemistry, and data analysis pipelines. These advancements have not only improved the performance and capabilities of sequencing platforms but also enhanced their accessibility, affordability, and usability, thereby fueling market growth.

One of the key technological advancements driving the global short read sequencing market is the development of novel sequencing chemistries and platforms. Companies are continuously innovating to improve sequencing accuracy, read lengths, and throughput, enabling researchers to generate higher-quality genomic data at faster speeds and lower costs. For example, advancements in nanopore sequencing technology have revolutionized the field by enabling real-time, single-molecule sequencing with minimal sample preparation requirements. Similarly, improvements in sequencing-by-synthesis techniques have led to the development of high-throughput sequencing platforms capable of generating billions of reads in a single run.

Furthermore, advancements in instrument throughput have significantly increased the scalability and efficiency of short read sequencing technologies. Modern sequencing platforms can process multiple samples simultaneously, allowing researchers to analyze large cohorts or conduct high-throughput screening experiments with ease. This scalability is particularly beneficial for large-scale genomic studies, population genetics research, and clinical diagnostics, where the ability to process large volumes of samples quickly is essential.

In addition to improvements in sequencing chemistry and instrumentation, advancements in bioinformatics tools and data analysis pipelines are driving market growth by facilitating the interpretation and utilization of genomic data generated by short read sequencing platforms. As the volume and complexity of genomic data continue to increase, there is a growing need for sophisticated bioinformatics solutions that can handle large datasets, identify genetic variants, and extract meaningful insights. Companies are developing user-friendly bioinformatics platforms and software packages that enable researchers and clinicians to analyze, annotate, and interpret genomic data efficiently, thereby accelerating scientific discovery and clinical decision-making.

Key Market Challenges

Data Analysis Complexities

One of the primary challenges hindering the Global Short Read Sequencing Market is the complexity of data analysis. Generating large volumes of genomic data is only the first step; analyzing and interpreting this data present significant challenges. Short read sequencing produces vast amounts of raw sequencing data, which must be processed, aligned, and analyzed using sophisticated bioinformatics tools and algorithms. The complexity of genomic data, including repetitive sequences, structural variations, and sequencing errors, complicates data analysis and interpretation, requiring advanced computational techniques and expertise. Addressing this challenge requires ongoing investment in bioinformatics research and the development of user-friendly analysis tools to streamline data processing and enhance the accuracy and efficiency of genomic analysis.

Standardization of Protocols

Another key challenge facing the Global Short Read Sequencing Market is the lack of standardization of protocols and workflows. Different sequencing platforms, library preparation methods, and data analysis pipelines may produce varying results, making it difficult to compare data across studies or laboratories. Standardizing protocols for sample preparation, sequencing, and data analysis is essential to ensure reproducibility, reliability, and comparability of genomic data. Collaborative efforts between industry stakeholders, regulatory agencies, and research communities are needed to establish standardized protocols, guidelines, and quality control measures for short read sequencing technologies. Additionally, initiatives such as proficiency testing and external quality assessment programs can help validate sequencing protocols and ensure consistent performance across different platforms and laboratories.

Ethical Considerations and Data Privacy

Ethical considerations surrounding genomic data privacy and consent present significant challenges for the Global Short Read Sequencing Market. Genomic data contain sensitive information about individuals' genetic makeup, predispositions to diseases, and familial relationships, raising concerns about data privacy, security, and potential misuse. Ensuring informed consent,

protecting patient confidentiality, and safeguarding genomic data from unauthorized access or disclosure are paramount. Regulatory frameworks and guidelines governing the collection, storage, and sharing of genomic data, such as the General Data Protection Regulation (GDPR) in Europe and the Health Insurance Portability and Accountability Act (HIPAA) in the United States, must be adhered to. Additionally, transparency in data handling practices, robust data encryption methods, and secure data storage infrastructure are essential to address ethical concerns and build trust among patients, researchers, and stakeholders in the short read sequencing market.

Key Market Trends

Advancements in Oncology Research

Advancements in oncology research are playing a significant role in boosting the Global Short Read Sequencing Market. Cancer, a complex genetic disease, presents unique challenges in diagnosis, treatment, and patient management. However, recent breakthroughs in oncology research, coupled with advancements in short read sequencing technologies, have revolutionized our understanding of cancer biology and treatment strategies. Short read sequencing technologies, also known as next-generation sequencing (NGS), have emerged as indispensable tools in oncology research. These platforms enable comprehensive genomic profiling of tumors, providing researchers and clinicians with valuable insights into the genetic alterations driving cancer initiation, progression, and treatment resistance. By sequencing the genomes of cancer cells, short read sequencing technologies can identify somatic mutations, copy number variations, and gene expression patterns associated with specific cancer types or subtypes.

One of the key ways in which advancements in oncology research are boosting the Global Short Read Sequencing Market is through the discovery of novel therapeutic targets. Genomic profiling of tumors using short read sequencing technologies has led to the identification of actionable mutations and molecular pathways that can be targeted with precision therapies. For example, the discovery of oncogenic driver mutations such as EGFR in non-small cell lung cancer (NSCLC) has paved the way for the development of targeted therapies such as tyrosine kinase inhibitors (TKIs), which have significantly improved outcomes for patients with EGFR-mutant NSCLC.

Moreover, advancements in oncology research have led to the development of novel biomarkers for predicting treatment response and prognosis. Short read sequencing technologies enable researchers to identify predictive biomarkers such as microsatellite instability (MSI) or tumor mutational burden (TMB), which can guide treatment decisions and help stratify patients based on their likelihood of response to therapy. Additionally, genomic profiling of tumors using short read sequencing can uncover mechanisms of treatment resistance, informing the development of new therapeutic strategies to overcome resistance and improve patient outcomes.

Furthermore, advancements in oncology research are driving the adoption of short read sequencing technologies in clinical diagnostics. Genomic profiling of tumors using short read sequencing can inform precision oncology approaches, enabling clinicians to tailor treatment regimens to individual patients based on their genomic profile. As precision medicine continues to gain traction in oncology, the demand for short read sequencing technologies in clinical diagnostics is expected to escalate, driving market growth and innovation.

Expansion of Applications in Non-Clinical Sectors

The Global Short Read Sequencing Market is witnessing a significant boost due to the expansion of applications in non-clinical sectors. While short read sequencing technologies have traditionally been associated with genomic research and clinical diagnostics, their versatility and scalability have opened up new opportunities in non-clinical fields such as agriculture, forensics, and environmental monitoring. In agriculture, short read sequencing is revolutionizing crop improvement, livestock breeding, and food safety testing. By sequencing the genomes of plants and animals, researchers can identify genetic variations associated with desirable traits such as yield, disease resistance, and nutritional content. This information is invaluable for breeding programs aimed at developing improved crop varieties and livestock breeds. Additionally, short read sequencing technologies enable rapid and accurate detection of pathogens and contaminants in food products, ensuring food safety and quality control.

In the field of forensics, short read sequencing is being used for DNA profiling and identification purposes. Short read sequencing technologies can analyze minute amounts of DNA from forensic samples such as hair, blood, or saliva, providing valuable genetic information for criminal investigations and identification of individuals. Moreover, short read sequencing enables the analysis of complex DNA mixtures and degraded samples, enhancing the accuracy and reliability of forensic analysis.

Furthermore, short read sequencing technologies are increasingly being applied in environmental monitoring and biodiversity conservation efforts. By sequencing environmental DNA (eDNA) from soil, water, or air samples, researchers can assess biodiversity, monitor ecosystem health, and detect invasive species or pathogens. Short read sequencing enables high-throughput analysis of eDNA samples, providing insights into microbial communities, species composition, and ecological interactions. This information is essential for conservation efforts, habitat restoration, and management of natural resources. The expansion of applications in non-clinical sectors is driving the demand for short read sequencing technologies and fueling market growth. As the versatility and scalability of short read sequencing platforms continue to improve, the adoption of these technologies in agriculture, forensics, and environmental monitoring is expected to accelerate further.

Segmental Insights

Product Insights

Based on the Product, the Consumables segment emerged as the dominant segment in the Global Short-Read Sequencing market in 2023. Consumables such as reagents, kits, and cartridges are essential components required for conducting short-read sequencing experiments. These consumables are consumed in large quantities during sample preparation, library construction, and sequencing reactions, making them indispensable for researchers and laboratories performing genomic analysis. The increasing adoption of short-read sequencing technologies across various applications, including genomics research, clinical diagnostics, and non-clinical sectors, has fueled the demand for consumables.

Application Insights

Based on the Application, targeted sequencing & resequencing segment emerged as the dominant segment in the Global Short-Read Sequencing market in 2023. Targeted sequencing allows for the identification of genetic variations, mutations, and biomarkers associated with specific diseases or conditions, enabling clinicians to tailor treatment strategies to individual patients based on their genomic profile. As precision medicine gains traction across various therapeutic areas, including oncology, rare diseases, and pharmacogenomics, the demand for targeted sequencing and resequencing technologies continues to rise.

Regional Insights

North America emerged as the dominant player in the Global Short-Read Sequencing Market in 2023, holding the largest market share. North America boasts a robust infrastructure for genomics research and development, with a concentration of leading academic institutions, research centers, and biotechnology companies driving innovation in the field of short-read sequencing. The region is home to prominent sequencing technology providers such as Illumina, Thermo Fisher Scientific, and Pacific Biosciences, who continue to spearhead advancements in sequencing platforms and applications. Also favorable government initiatives and funding support for genomics research and precision medicine initiatives have contributed to the dominance of North America in the global short-read sequencing market.

Key Market Players

?□Illumina, Inc.
?□Invitae Corporation
?□Thermo Fisher Scientific, Inc.
?□Pacific Biosciences of California, Inc.
?□BGI Genomics Co., Ltd
?□QIAGEN NV
?□Agilent Technologies
?□Azenta US, Inc. (GENEWIZ)
?□PerkinElmer, Inc.
?□ProPhase Labs, Inc. (Nebula Genomics)

Report Scope:

In this report, the Global Short-Read Sequencing Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

?□Global Short-Read Sequencing Market, By Product:

- o Instruments
- o Consumables

o Services
?Global Short-Read Sequencing Market, By Application:
o Whole Genome Sequencing
o Whole Exome Sequencing
o Targeted Sequencing & Resequencing
o Others
?Global Short-Read Sequencing Market, By End-User:
o Academic & Research Institutes
o Hospitals & Clinics
o Pharmaceutical & Biotechnology Companies
o Others
?Global Short-Read Sequencing Market, By Region:
o North America
? United States
? Canada
? Mexico
o Europe
? France
? United Kingdom
? Italy
? Germany
? Spain
o Asia-Pacific
? China
? India
? Japan
? Australia
? South Korea
o South America
? Brazil
? Argentina
? Colombia
o Middle East & Africa
? South Africa
? Saudi Arabia
? UAE
Competitive Landscape
Company Profiles: Detailed analysis of the major companies present in the Global Short-Read Sequencing Market.
Available Customizations:
Global Short-Read Sequencing Market report with the given market data, Tech Sci Research offers customizations according to a company's specific needs. The following customization options are available for the report:
Company Information
?Detailed analysis and profiling of additional market players (up to five).

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