Customer Story

MERCK

Challenge

Speed advances in biomarker research by deploying statistical methods to exploit increasingly sophisticated oncology data.

Exploratory analysis elevates innovation in biomarker science

Cross-functional teams at Merck KGaA, Darmstadt, Germany, combine subject matter expertise, clinical data analysis and exploration to pursue new oncology therapies.

Recent biomarker research has led to the creation of increasingly targeted drugs and diagnostic assays. This personalized approach to health care is largely made possible by the proliferation of new technologies that generate larger and more complex data sets. With access to increasingly sophisticated patient data, scientists can now investigate diagnostic and drug response questions that until recently were beyond the capabilities of available technology. The sheer quantity of data involved in pharmaceutical research has created a need for robust analytical tools that can simultaneously manage a high throughput of data while providing an interactive, user-friendly interface that facilitates collaboration between experts with a range of statistical expertise.

Biomarker development offers an exciting window into the unique impacts of technology and analytics on the ability to provide a truly patient-specific treatment regimen in oncology. Biomarker scientists evaluate various biological interactions between drugs and patient subgroups to better understand treatment efficacy and outcomes, allowing health care providers to prescribe the ideal treatment for each patient.

To both effectively deploy these patient-specific drugs and gain regulatory approval, researchers must concurrently develop companion diagnostic (CDx) assays to identify biomarker-positive patients. Although this "one drug/one test" model has improved outcomes for many patients, some still do not respond to treatment as expected, leaving researchers with more questions that often remain unanswered and unexplored.

Data exploration, a key part of biomarker research

To address these shortcomings, pharmaceutical innovators such as Merck KGaA in Darmstadt, Germany employ not only subject matter experts and statisticians, but also individuals whose expertise blends the two.

The very existence of such a role shows the company's foresight; the ability to dig into the data to explore unexpected outcomes, identify new insights and inform future research design will soon be a necessary step in any research environment.

"[I was brought on] specifically to do additional investigative and exploratory analysis, to get additional insight from the data," says Angela Manginelli, PhD, now Senior Scientist in Biomarker Data Analytics at Merck KGaA, Darmstadt, Germany. "Not only what is planned in the clinical statistical plan, but also to go beyond that and see if we can gain more knowledge about the data during additional analyses, which were not planned at the start."

Manginelli works to support a range of analytical needs within biomarker research as part of the organization's many cross-functional scientific teams. "When we get clinical data, it's [my role to work with] the subject matter experts to plot the data, to visualize them, to explore statistical models aimed at interpreting them and finally getting an understanding of what the data are telling us. We need to identify the biomarkers that will give us better insight into what a treatment is doing," she explains.

Pairing statistical robustness with a user-friendly interface

As the volume and complexity of clinical data grows, so do the demands on Merck KGaA, Darmstadt, Germany's biomarker analytics and research teams. Although technology has advanced to give researchers the tools to conduct multivariate experiments and improve their overall statistical

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>
> Angela Manginelli, Senior Scientist

power and reproducibility, many scientists lack the statistical expertise and training to understand and take full advantage of the statistical resources that Manginelli and her colleagues offer.

Tools like JMP®, capable of analyzing data in a timely and nimble manner are highly valuable, because they help bridging the gap between Manginelli and the subject matter expert she collaborates with. Moreover, JMP is built in a very user-friendly and intuitive way.

"I like that you can live-switch from one graph to another, or interactively highlight the parts that are most interesting. I also like the JMP Variability Chart, because you can visualize the data in a very clear way, grouping by factors or by variables that might have an effect. Then you can highlight potential effects and test it with statistical models."

"JMP is an important tool for such kind of analysis. And I get extremely positive feedback from internal customers when I show them the outcome of my analysis. It's very impressive for them to be able to see the data so easily, in one place all together, while clearly distinguishing between potential critical factors, such as visit and dose level. Some of the [subject matter experts] now want to use JMP themselves."

Microsoft Excel and other tools like it are rather limited in the way one can work with the data and in the understanding of the data one can derive from. On the other end of the spectrum, Manginelli says open-source programming languages like R are not always an option – though she herself is a capable coder – "because R is not so intuitive and needs to be programmed. In JMP, you just click and drop, and you have the graph."

And when there is a complex task at hand, Manginelli says, JMP and SAS work seamlessly together. "When you have a huge data set, and you routinely want to produce some result, or you want to validate some scripting, SAS is appropriate. And I like that JMP and SAS talk together quite nicely."

The use of a statistically robust standard tool like JMP also helps scientists at Merck KGaA, Darmstadt, Germany to perform the quality and reliability validation functions as mandated by the regulatory bodies. JMP, Manginelli says, combines a user-friendly interface and high-quality standard for statistical methodologies. "This is extremely important in order to meet requirements of regulatory bodies," she says.

Acquiring knowledge with collaboration and shared tools

With the flexibility afforded by JMP, scientists can explore the data more thoroughly, allowing them to use their biological expertise to tailor analyses and identify issues or outcomes more readily than with fully automated analytical tools. This flexibility also facilitates effective decision making; quick turnaround times let the team evaluate multiple scenarios and provide broader statistical justification than previously available.

With the expansion of analytical capabilities, scientists across the biomarker industry are finally able to begin unlocking the critical information hiding in patient data. Understanding how to customize treatments to individual patients will become more and more common as scientists like Manginelli help to shed light on the biological interactions between drugs and patients.

The process of drug approval is challenging, but with the right tools, researchers can extract previously unknown associations that will change the way treatments are delivered, bringing oncology research closer to achieving personalized health care.

Manginelli concludes: "The most important measuring point is the ability to make a difference. The knowledge we can acquire with the analysis of data really impacts our clinical trials. It is therefore crucial to have tools like JMP available, which greatly support the purpose of my job.".

Solution

Biostatisticians use interactive features in JMP® to perform robust statistical analyses in less time. The approachable interface of JMP makes it easy for statistical experts to collaborate with subject matter experts.

Results

By improving statistical rigor and reproducibility, the joint effort of biostatisticians and researchers speeds critical innovations in an emerging field of health care.

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