Precision Medicine: From Breakthrough to Follow-Through

Genomes2People 3 hours ago · 7 min read

by Nic Encina

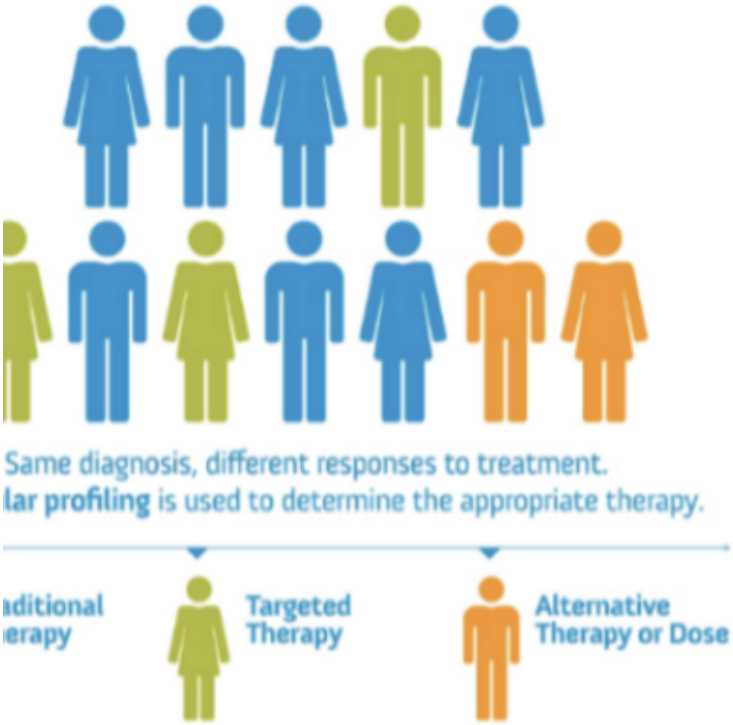
Our recent launch of Precision Population Health officially introduced Ariadne Labs into the world of precision medicine. Since being founded in 2012, Ariadne Labs has specialized in developing scalable systems-level solutions for life's most critical moments and the stages in between — such as surgery, maternal health, serious illness and palliative care, and primary health care. Although our work may not have dealt directly with precision medicine, we were far from removed from it. Ariadne Labs was founded and built in the image of The Broad Institute. Many of our faculty and staff participated in the Human Genome Project and have been involved in the 'omics', such as genomics, for decades. Our overlapping interests led us to seeing the commonalities in our work and to identifying a time when these

breakthrough technologies would be in need of follow-through implementation frameworks.

Our work has dealt with developing solutions to improve healthcare quality, independent of national, technical, or economic contexts. In other words, work in the pursuit of saving lives and reducing suffering for everyone, everywhere. Ariadne Labs has tackled complex health system problems ranging from assessing health system readiness in adopting interventions, *to* training clinicians on principles of palliative care, *to* creating vaccination guides for use with patients hesitant to take the COVID-19 vaccine, *to* coordinating multidisciplinary surgical teams, *to* educating patients and empowering them to participate in the decision-making process of their own care in ways that align with their personal life goals.

So what does that have to do with the high-tech world of precision medicine, which has revolutionized specialty areas such as oncology, rare disease, and fertility? That's just it, actually — it turns out that precision medicine is primed to bridge the divide between specialty care and everywhere else in medicine. Two decades after the Human Genome Project delivered the first human sequence, we now have advanced tools, diagnostics, therapeutics, and analytics that have given us tremendous insight and influence over human biology, and we have been identifying more and more markers that indicate elevated risk for conditions

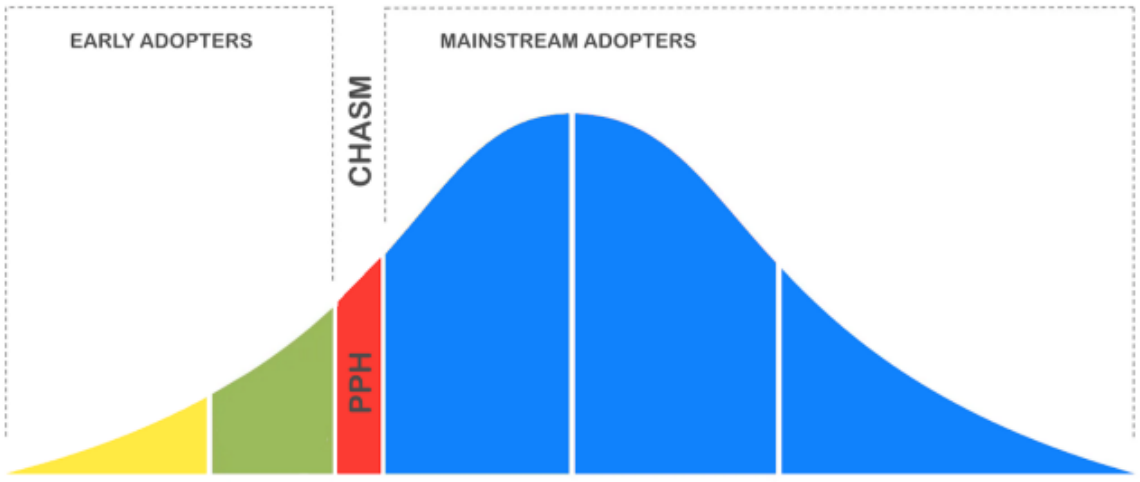
that are not only treatable if detected early, but in some cases preventable altogether.

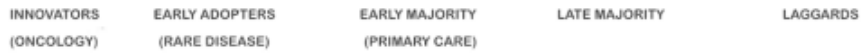


In other words, there is a growing body of evidence in precision medicine that has swelled onto what we call the "Know-Do" gap at Ariadne Labs — gaps between what we know should be done in theory, and what actually takes place in clinical practice. As such, there are elements of genomics, for example, that we *know* lead to better care, yet we are not *doing* what is necessary to apply them appropriately. When you consider that these markers code for cardiovascular and cancer-causing mutations, the possible effects on population health are staggering.

To be clear, what we're talking about is a new era in medicine. Potentially one that starts shifting our thinking from reactive to proactive, and even preventive. Consider that in twenty years we have arrived at a place in oncology where any form of diagnosis and treatment automatically draws on our mastery over

genomics, from precisely understanding the type of cancer(s) involved to devising the best course of treatment that's based on pharmacogenomic insights. For any of us who have had a grandfather or friend who saw an extra year of life, or more, it almost seems like magic. Now, what if we could take this to the next level, moving upstream, where we could prevent a niece or son from ever having that cancer in the first place? It's entirely reasonable to think that in their lifetimes we'll achieve much of this, but the only way that we will stand a chance at realizing it is by bringing these tools into primary care, where the main goal should be to *keep* people healthy in the first place. This type of *follow-through* is necessary to make precision medicine and genomics a fabric of every day care. We can think of it, in a way, like an adoption curve, whereby oncology and rare diseases have played the roles of *innovators* and *early adopters*, but we stand at the chasm that separates us from the *majority,* which is where primary care and the rest of society live:





"That's all great" one might say, but what does that have to do with "scalable, systems-level solutions"? Well, getting innovations adopted in health care takes more than creating useful new technology. Once an innovation passes the R&D phase it quickly encounters the realm of implementation science, where a strategic and systematic deployment of an intervention can make the difference between a broadly adopted solution that impacts millions of lives, and a promising technology that didn't quite resonate with its target clinical audience. In cases where the outcome isn't so binary, an intentional and scientific rollout of an intervention can also determine the rate at which it diffuses across medicine when compared to the average 17 years that it takes most innovations to become adopted passively. (Again, think of that implementation "chasm" between specialty care and primary care.) When the effect of that technology today can impact millions of lives every year, we simply don't have that kind of time to spare.

Another way of thinking about this is that precision medicine today is where automobiles were in 1908: Much of the engineering work had been done in the two decades from Karl Benz' *Benz Patent-Motorwagen* to Ford's *Model-T*, and the world was completely unaware of how society would change forever.

The only problem was that nobody knew how to drive, and there were few applicable road rules other than those inherited from horse and buggy. By the 1930s there were hundreds of thousands of cars flooding lawless streets in the complete absence of any street signs, street lights, road laws, traffic signals, brake lights, and so on. We're at that moment with precision medicine, where we have to make intentional decisions on how to make this new medicine accessible, useful, safe, equitable, and actionable at the point of primary care. The implementation tools, processes, and communication guidelines that will be required are precisely what Ariadne Labs specializes in.

Ariadne Labs uses human centered design, health systems implementation science, public health expertise, and frontline clinical experience to solve some of health care's biggest problems. We take a systematic, data-driven, multi-disciplinary, and "product development" approach to creating contextually appropriate and scalable tools to guide clinicians toward doing the right thing. When you look at the underlying data, the implementation challenges across different areas of medicine are related, and our experience directly maps to the hurdles that precision medicine now faces as it begins its migration into primary health care.

However, in our arsenal of tools and experience, there is an absence of real-world clinical experience in genomic medicine.

This is what makes our union with Genomes2People a special and auspicious one. For more than a decade, Genomes2People, a research program at Brigham and Women's Hospital, the Broad Institute and Harvard Medical School, has been spearheading much of the research work in returning genomic results to patients and clinicians. Their work has continuously explored frontiers in educating and empowering patients and clinicians with genomic data and, in the process, has made genomics far more accessible than its traditionally exceptionalized role in specialty medicine. Their work contributed to the establishment of the ACMG-59 (now known as ACMG 3.0) and they led some of the most ground-breaking studies that returned genomic results to infants, military personnel, African Americans, and healthy families. We can thank Genomes2People for much of the heavy lifting that brought us to this particular moment, where genomics is beginning its diffusion across general medicine.

We feel that Genomes2People's real-world research in genomic return-of-results combined with Ariadne Labs' practical approach to health system innovation and implementation are aptly suited for tackling implementation obstacles that stand in the way of realizing care that is rooted in a code of life that has as many opportunities for treating disease as it does in preventing it. This being a worthwhile yet ambitious journey will require many minds tackling different aspects of implementation, which is why we're thrilled to also include as core partners experts from the VA

Boston Healthcare System, Harvard Pilgrim Health Care Institute, and Brigham & Women's Hospital, all of which complement, enrich, and amplify our scope of work in directions such as polygenic risk scores and econogenomics. Our unified vision is one in which tools, guidelines, and implementation frameworks will one day exist that enable any health system, whether a large, academic medical center or a small, rural clinic to adopt and practice elements of precision medicine in delivering better care to patients. A vision that makes genomics as commonplace in medicine as XRays and MRIs. A vision that pairs scientific breakthroughs with the implementation follow-through for broad impact. A vision that could someday affect the life of every person, everywhere.

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Precision Medicine Public Health Genomics Healthcare Medicine