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BIG DATA IN BIOMEDICINE

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Cover art: Tatiana Plakhova

It may now cost less to sequence the three billion DNA base pairs of a human genome than to do a brain scan. But how does all that genomic data translate into treatment?

Life scientists are bringing together astonishing volumes of information from genomic sequencing, lab studies and patient records. And the resulting era of 'precision medicine' is already delivering treatments tailored to individual needs.

These 'big data' efforts face huge challenges, from creating analytic tools and solving scientific puzzles to accessing millions of gigabytes of data and overcoming barriers to accessing patients' health records (see pages S2 and S19).

Dozens of international projects are producing huge amounts of biomedical information, not just on the genome but on many other '-omes' (S8). Giant strides are being made in mapping the human proteome and building a 'parts list' of the body (S6). Meanwhile, smartphones and other wearable devices are generating continuous flows of health data from large numbers of people (S12). This vast array of data will allow a more detailed understanding of disease traits in analyses known as deep phenotyping (S14). Research organizations are assembling cloud-based 'information commons' to standardize, store and share the data (S16).

Drug companies are facing complex choices (S18). Many are opting to treat cancer, a main thrust in national programmes such as the UK 100,000 Genomes Project (S5). And some of these therapies are already changing clinical practice (S10).

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Eric Bender
Contributing Editor

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