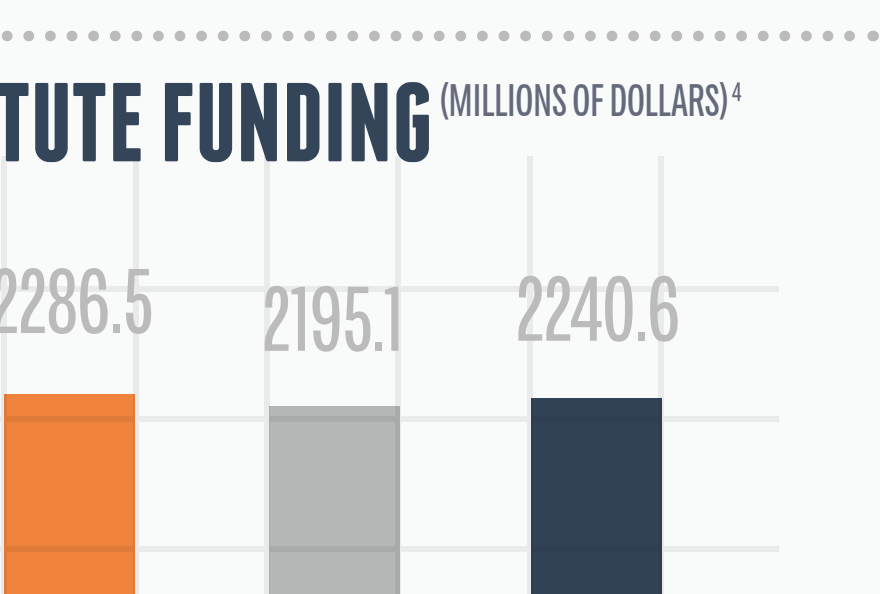
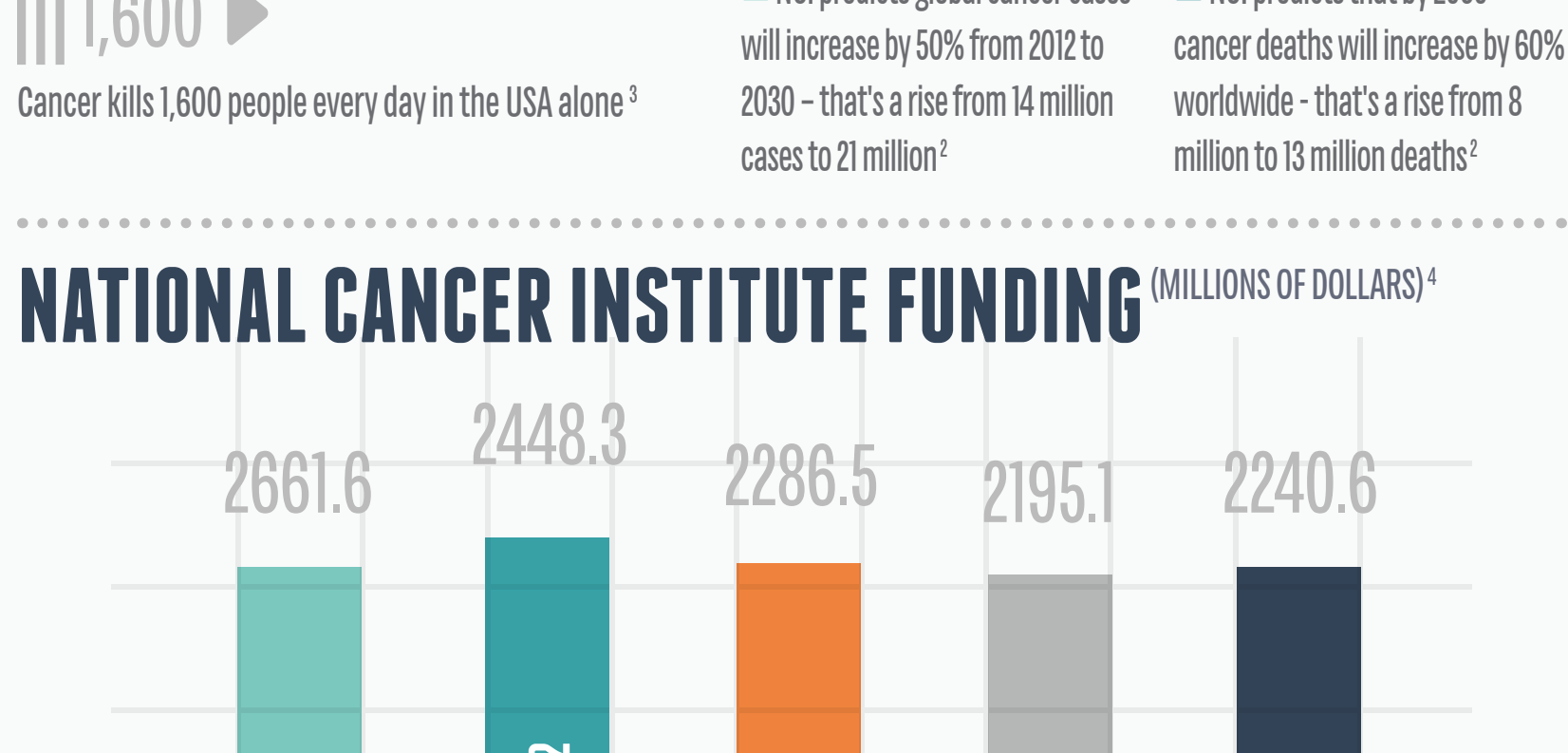


# CANCER RESEARCH

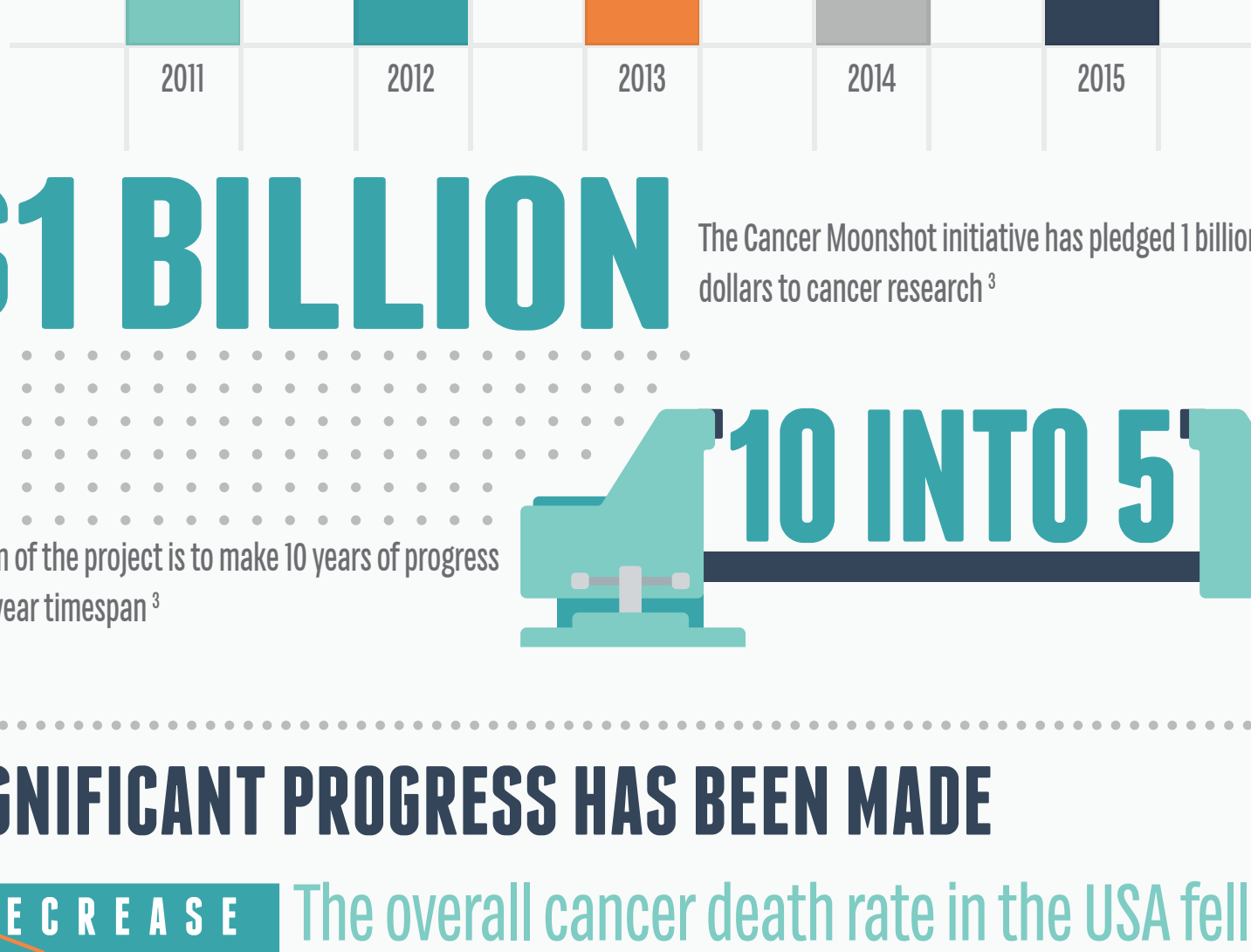
We are living in an exciting era for cancer research, with basic research discoveries fuelling a swift translation of new and personalized therapies. But, being made up of over 200 subtypes, cancer is a complex disease that demands study from multiple perspectives<sup>1</sup>. Research ranges from tracking the epidemiology of the disease to understanding the molecular biology that underlies it and translating these discoveries into therapeutics. Many of billions of dollars have already been invested in cancer research around the world. Meaning we have a better understanding than ever of the drivers of the disease and how to predict, diagnose, suppress and treat it.

This infographic highlights some of the key trends in cancer research and demonstrates why this disease has become a research priority around the globe.

## A HUGE BURDEN



## NATIONAL CANCER INSTITUTE FUNDING (MILLIONS OF DOLLARS)<sup>4</sup>

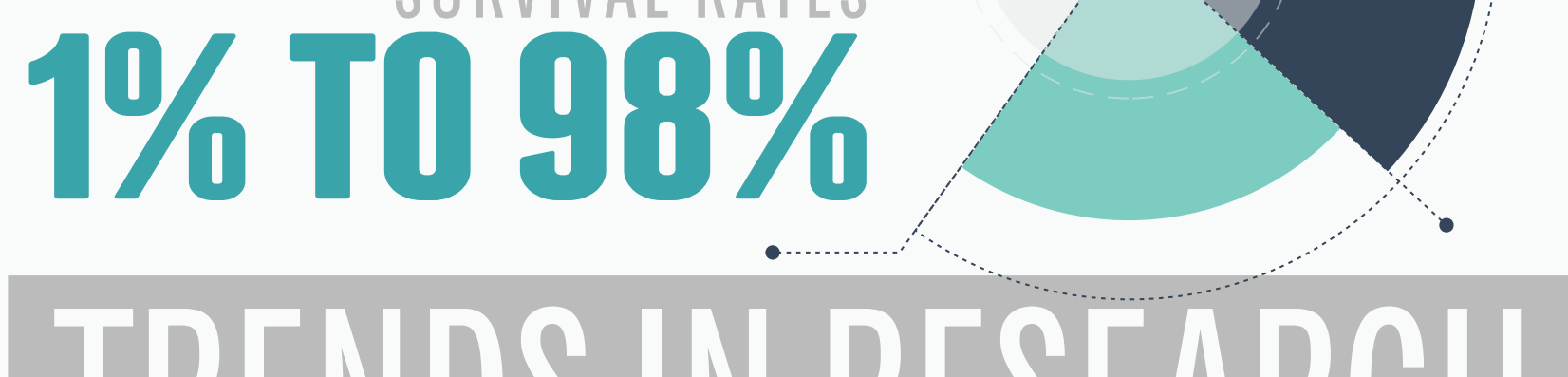


## \$1 BILLION

The Cancer Moonshot initiative has pledged 1 billion federal dollars to cancer research<sup>5</sup>



## SIGNIFICANT PROGRESS HAS BEEN MADE



## FOCUS MUST NOW BE GIVEN TO A WIDER RANGE OF CANCERS



## TRENDS IN RESEARCH

### THE TOP 5 COUNTRIES BY PUBLICATION OUTPUT IN 2014<sup>7</sup>



### GROWTH IN THE NUMBER OF PUBLICATIONS HAS COME FROM TWO BIG PLAYERS<sup>7</sup>

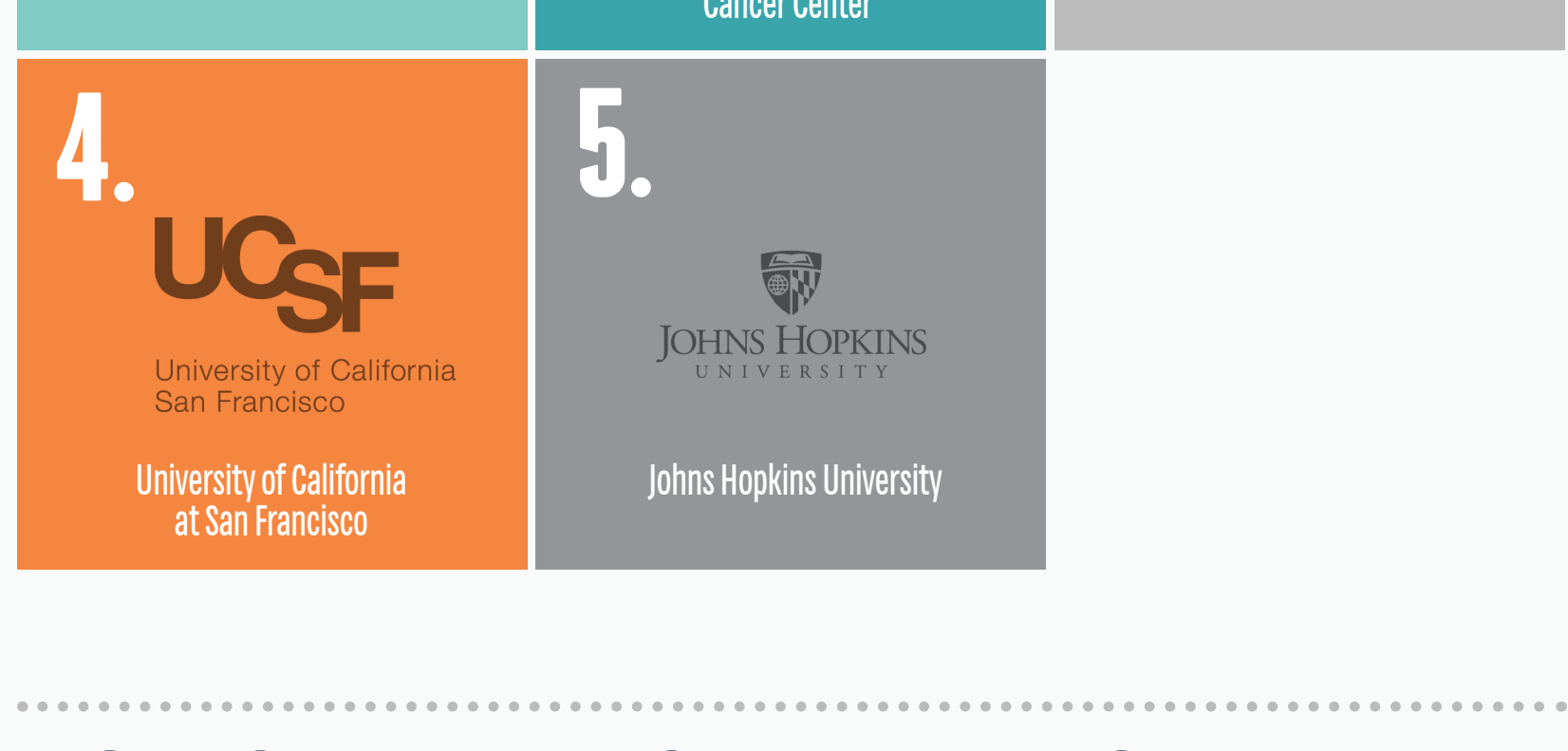


### COMPOUND ANNUAL GROWTH RATE OF PUBLICATIONS IN CANCER RESEARCH IN THE TOP 3 GROWING COUNTRIES FROM 2005-2014<sup>7</sup>



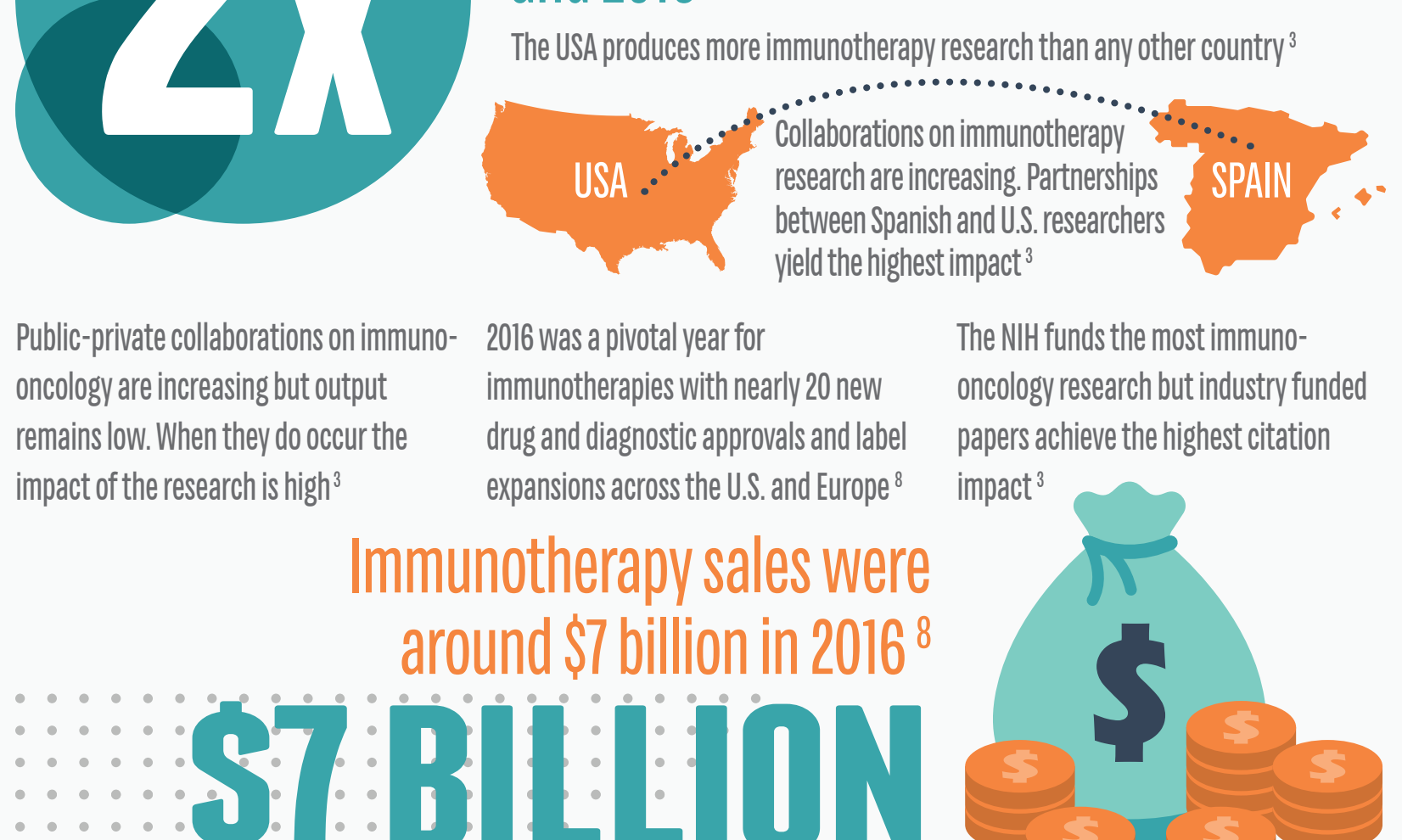
### THE MOST IMPACTFUL CANCER RESEARCH COMES FROM INSTITUTIONS IN THE USA<sup>7</sup>

According to Scopus the top 5 are:



## RESEARCH AND DEVELOPMENT THEMES

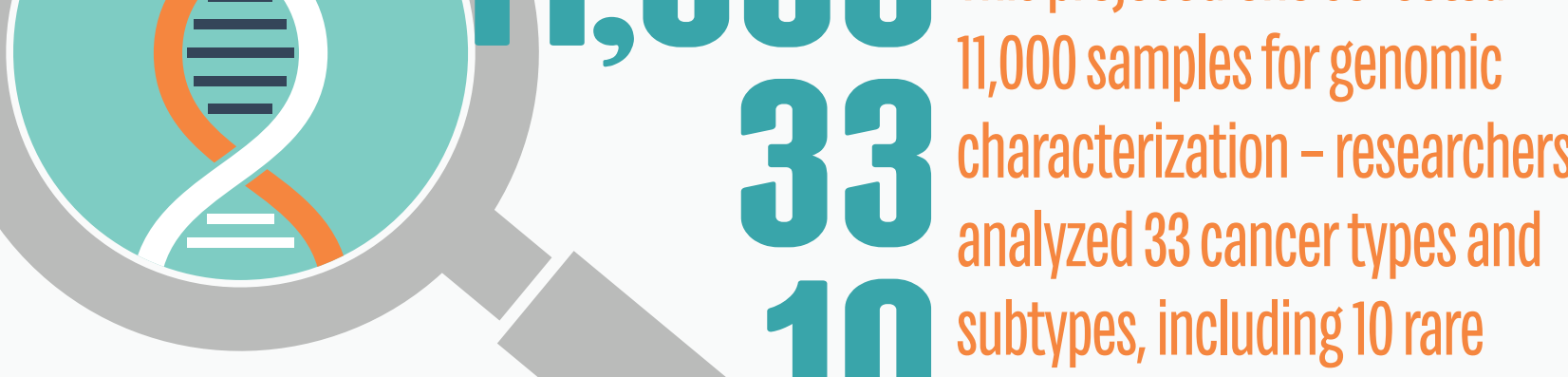
Discoveries in the field of cancer genomics and immunology have established two new pillars of cancer care: Precision therapy and immunotherapy



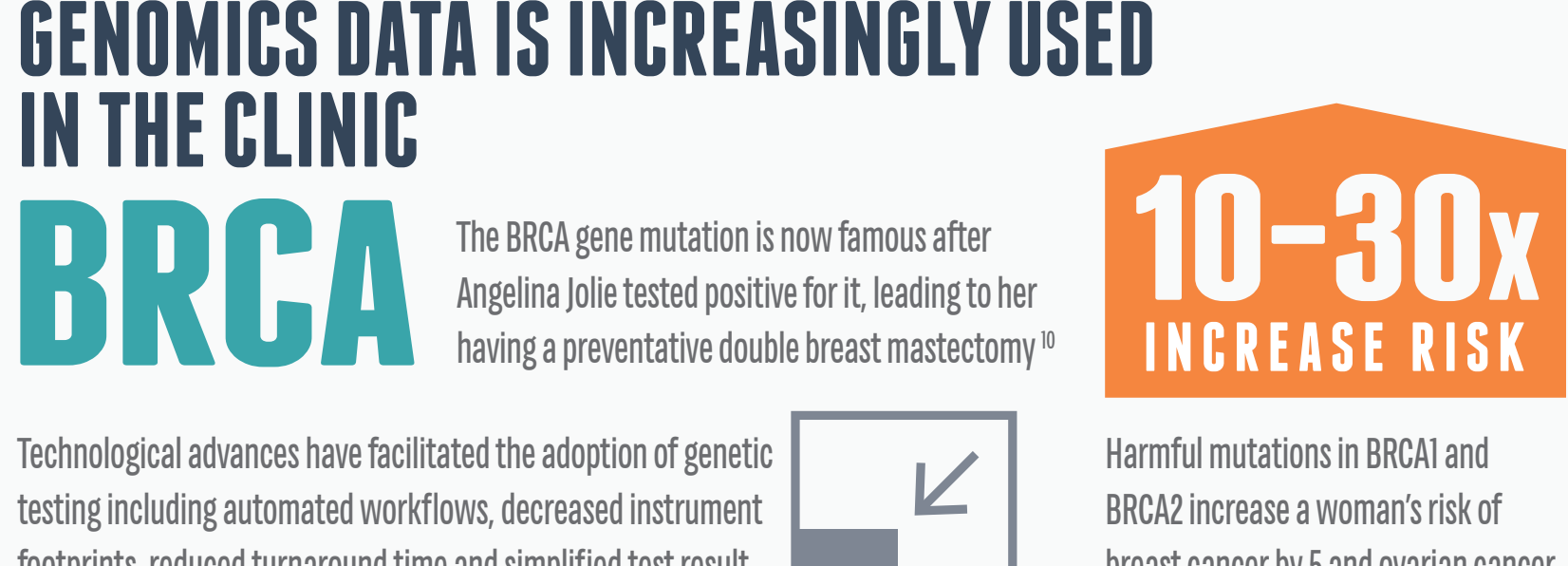
Public-private collaborations on immunology are increasing but output remains low. When they do occur the impact of the research is high<sup>3</sup>

2016 was a pivotal year for immunotherapies with nearly 20 new drug and diagnostic approvals and label expansions across the U.S. and Europe<sup>8</sup>

The NIH funds the most immunology research but industry funded papers achieve the highest citation impact<sup>3</sup>



## GENOMICS DATA IS INCREASINGLY USED IN THE CLINIC

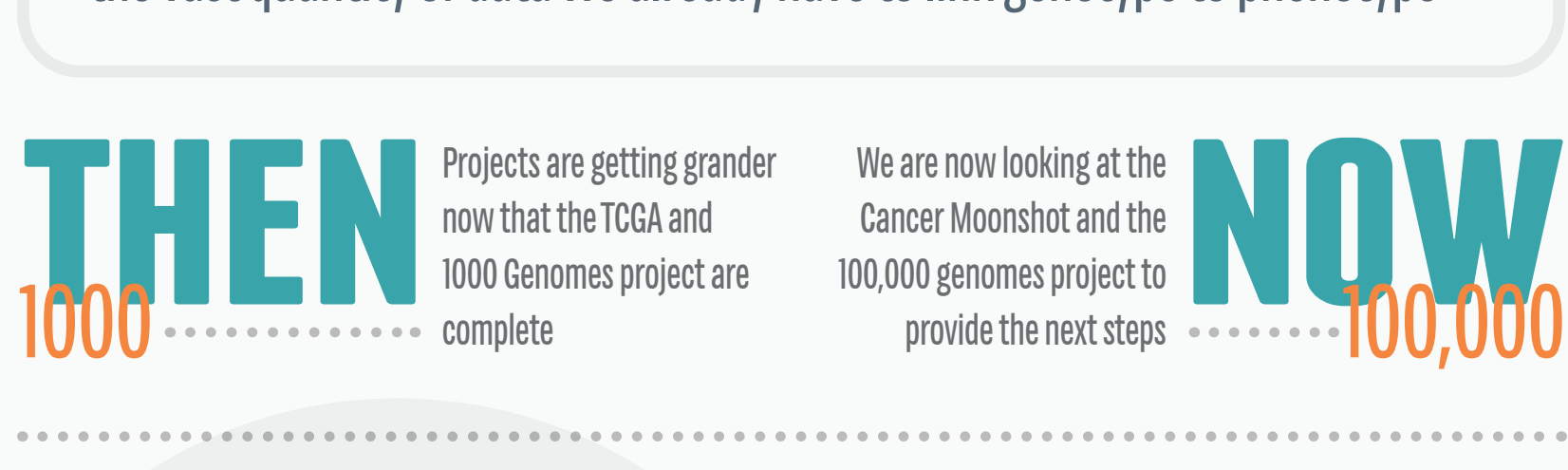


Technological advances have facilitated the adoption of genetic testing including automated workflows, decreased instrument footprints, reduced turnaround time and simplified test result interpretation

Clinical genomics has now moved closer to the patient, away from centralised diagnostics labs

Developments in point of care testing and crude sample analysis will see this trend continue<sup>12</sup>

Bioinformatics projects like ASCO CancerLinQ will continue to leverage the vast quantity of data we already have to link genotype to phenotype<sup>12</sup>



## PHARMACOGENOMICS

Pharmacogenomics, is the study of how genetic variation contributes to an individual's response to drugs.



These markers can play an important role in identifying responders and non-responders to medications, avoiding adverse events, and optimizing drug dose

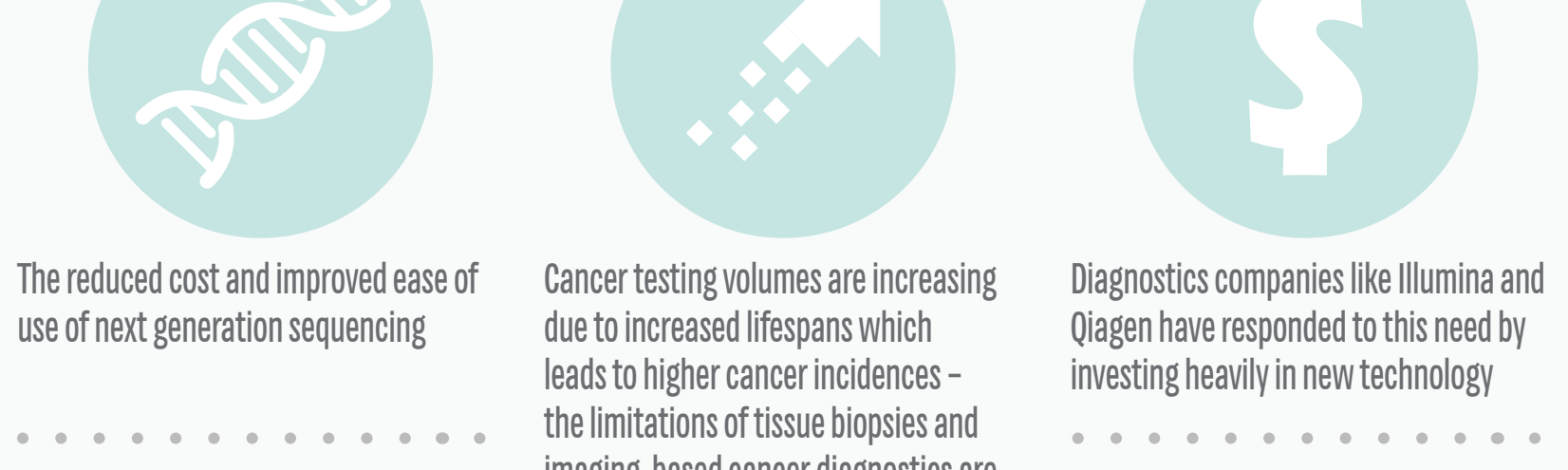
Pharmacogenomics can help describe

- DRUG EXPOSURE AND CLINICAL RESPONSE VARIABILITY
- RISK FOR ADVERSE EVENTS
- GENOTYPE-SPECIFIC DOSING
- MECHANISMS OF DRUG ACTION
- POLYMORPHIC DRUG TARGET AND DISPOSITION GENES
- TRIAL DESIGN FEATURES

## NON-INVASIVE CANCER SCREENING

Liquid biopsies are increasingly being used to detect DNA shed by tumours into the bloodstream. Benefits of this approach include:

- NON-INVASIVE
- CAN BE USED TO ROUTINELY SCREEN FOR EARLY-STAGE CANCERS
- ENABLES EASY MONITORING OF PATIENT RESPONSE TO TREATMENT
- CAN HELP EXPLAIN WHY SOME CANCERS ARE RESISTANT TO THERAPIES



The reduced cost and improved ease of use of next generation sequencing

Cancer testing volumes are increasing due to increased lifespans which leads to higher cancer incidences – the limitations of tissue biopsies and imaging-based cancer diagnostics are holding up testing labs strengthening the case for the more efficient liquid biopsy approach

Diagnostics companies like Illumina and Qiagen have responded to this need by investing heavily in new technology

GRAIL plans to launch blood-based pan-cancer screening tests for early cancer detection in 2019 priced at \$1000 or less<sup>15</sup>

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