



# An Analysis of Biomarker Roles within Clinical Trials

Presented by: Randall Crisp

# Who uses Clarivate Analytics Data?



## Academic Institutions

## Commercial Enterprises

## Governments

## BioPharma Innovators



Trusted by **top 50** pharma companies

**78%** of publicly-traded biotechs

**60,000+** Cortellis users

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## SSA As A Major Pharmaceutical Market



oThe pharmaceuticals market in Africa is expected to reach a business opportunity of **\$45 billion in 2020**, propelled by a convergence of changing economic profiles, rapid urbanization, increased healthcare spending and investment, and increasing incidence of chronic lifestyle diseases.

oThe tropical climate of Africa makes the continent the **largest reservoir of infectious diseases**, particularly malaria, (TB), and acquired immune deficiency syndrome (AIDS).

oWith the increasing adoption of Western lifestyle in Africa, there has been a paradigm shift in the burden of illness towards non-communicable diseases (NCDs), driving the **demand for chronic prescription drugs**.

oDespite all of this, high growth within this market is achievable.

| Rank | Country | Market (\$MM) |
|------|---------|---------------|
| 1    | USA     | 339,694       |
| 2    | Japan   | 94,025        |
| 3    | China   | 86,774        |
| 4    | Germany | 45,828        |
| 5    | France  | 37,156        |
| 6    | Brazil  | 30,670        |
| 7    | Italy   | 27,930        |
| 8    | UK      | 24,513        |
| 9    | Canada  | 21,353        |
| 10   | Spain   | 20,741        |

## Sub-Saharan Africa is Diverse



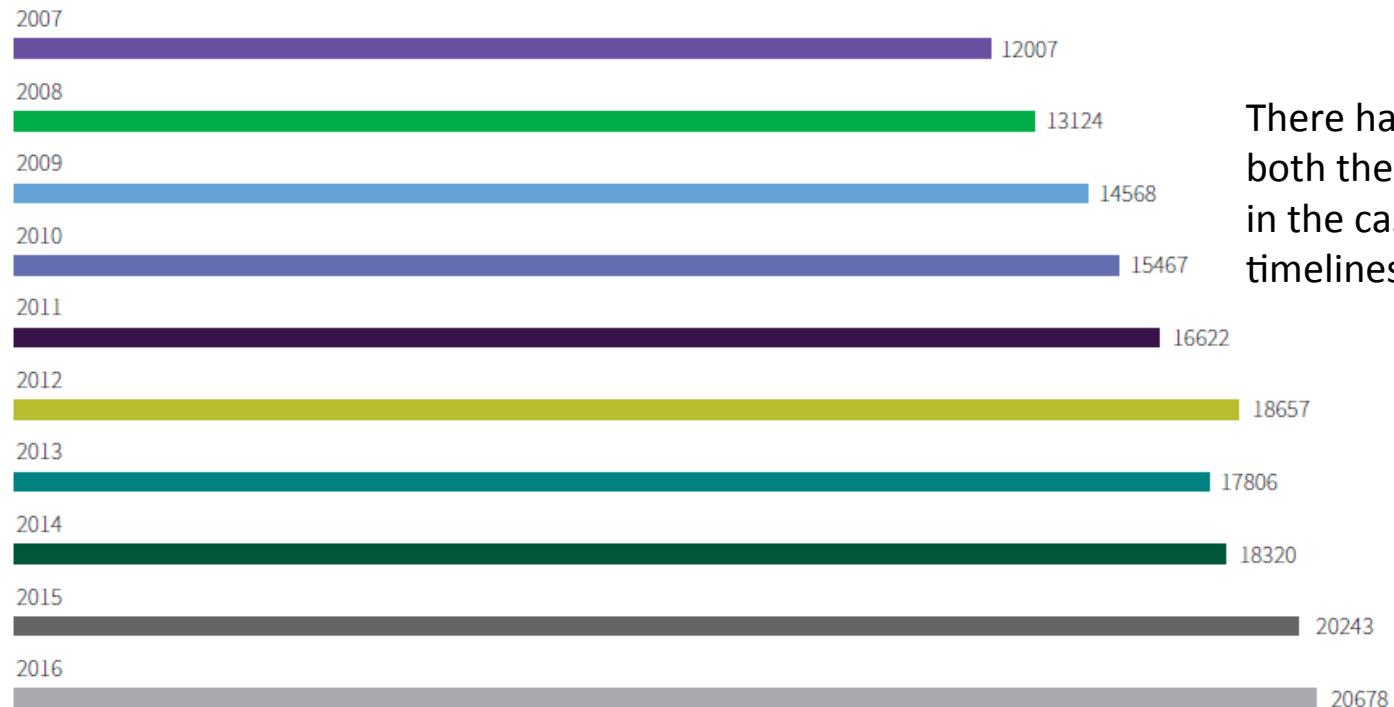
- Geographically comprising of 48 countries, Sub-Saharan Africa (SSA) represents the most genetically diverse region.
- SSA accounts for 64% of the global disease burden from human immunodeficiency virus (HIV/AIDS), tuberculosis (TB) and malaria, but only 4% of the world's health workforce. Its pharmaceuticals sector faces challenges with high drug prices and regulations, which open up opportunities for illicit imports and production.
- Between 2005 and 2015, six of the world's 10 fastest-growing countries were in SSA – Angola, Nigeria, Ethiopia, Chad, Mozambique and Rwanda. In eight of the past 10 years, SSA has grown faster than Asia. In 2020, the International Monetary Fund expects Africa to grow at a rate of 6% - about the same as Asia. Continuing such trends, it is estimated that by 2035, Africa's workforce, which is larger than any other continent, will be making significant strides in the fields of agriculture, healthcare, manufacturing, hospitality and technology.

## The Cost of Clinical Trials



- There is a lot of discussion across biopharma about the increasing complexity in the design and management of clinical trials. Recent estimates suggest the cost of bringing a drug to market is as high as \$3 billion, and only one in 10 drugs successfully navigate the process and make it to market. These trends are not sustainable, and the use of targeted clinical strategies is being seen as a critical step towards improving success rates.
- According to the Centers for Medical Research (CMR) in the year 2015 the probability of success moving from Phase 1 to market is less than 10% over all therapy areas.
- Efficacy is the reason for failure in more than half of Phase II and Phase III trials.

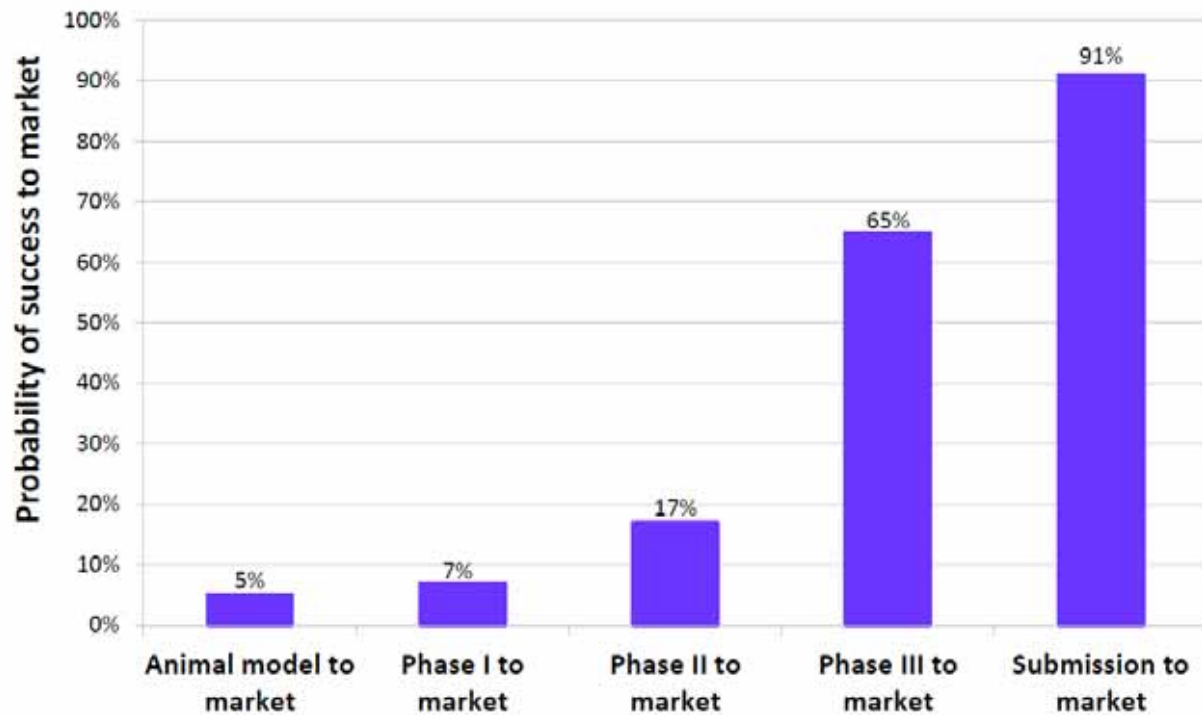
# Clinical Trials by year



There has been a significant rise in both the number of clinical trials and in the case of oncology, clinical trial timelines.

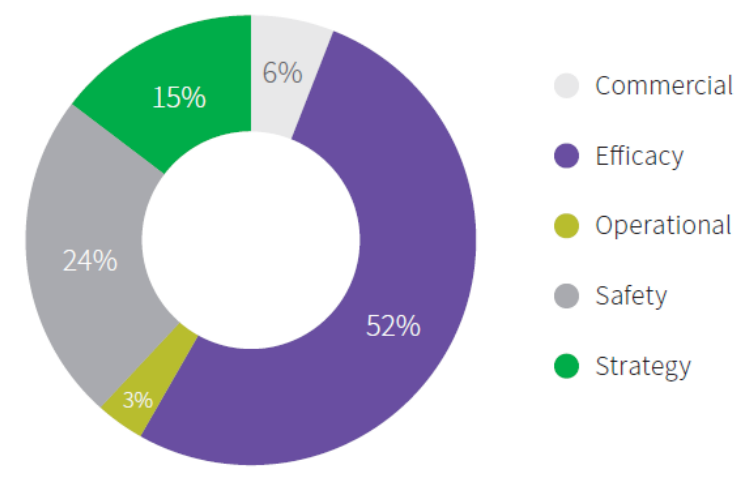
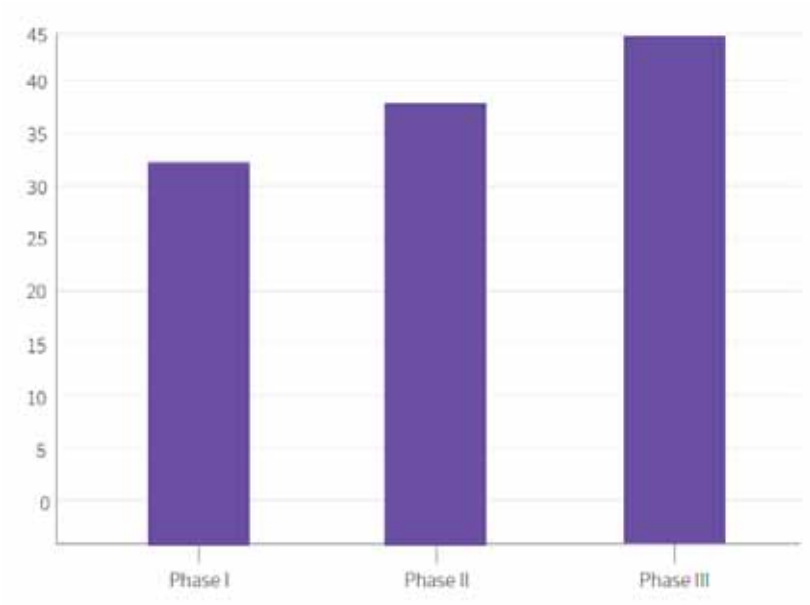
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# Clinical Attrition Rates



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# Mean Phase Length vs Failures



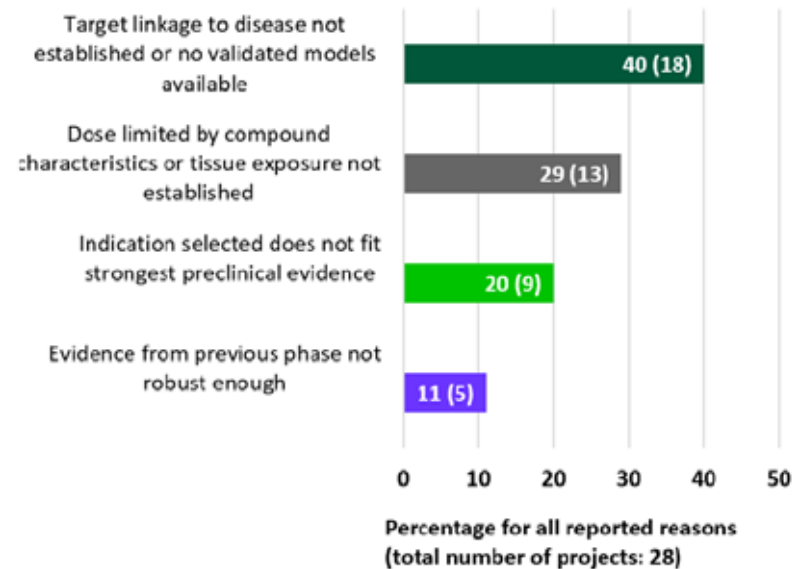
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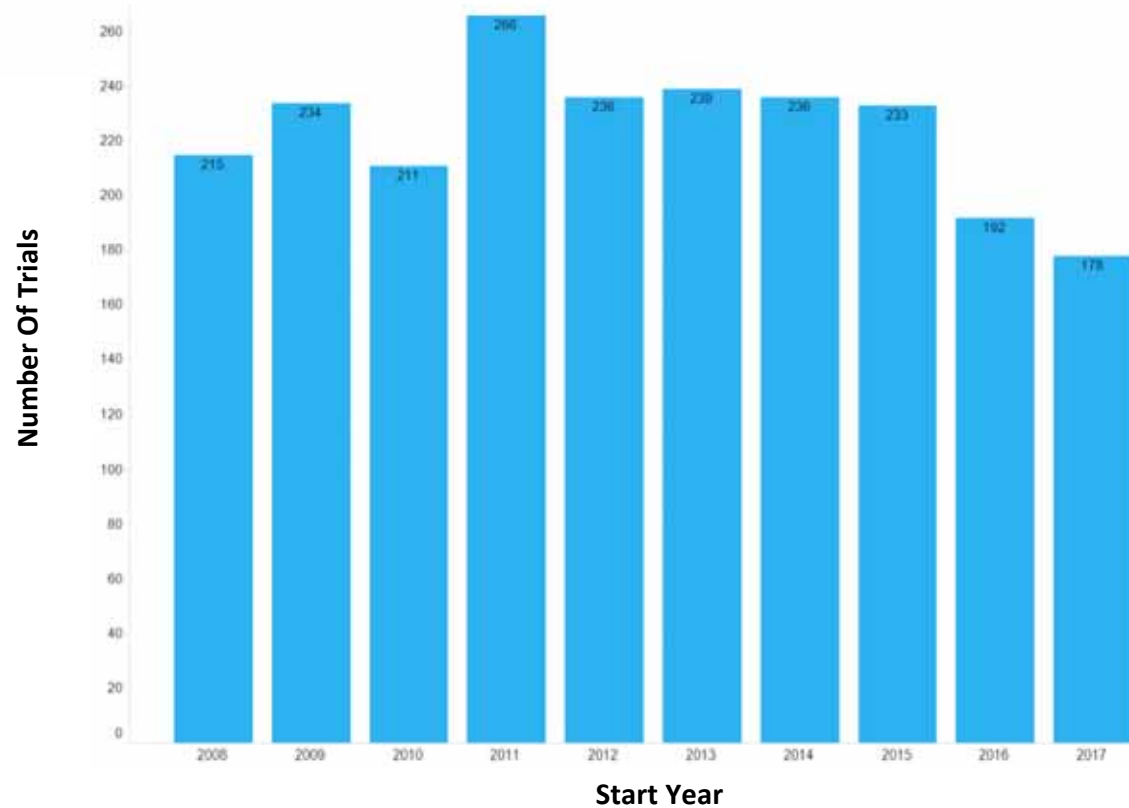
## Reasons for Lack of Efficacy



- According to a study by Astra Zeneca 40% of their projects failed in clinical trials because no clear link was made between the target and the disease.
- An additional 29% failed because the compound chosen did not have the correct physical properties or did not reach the target tissue.

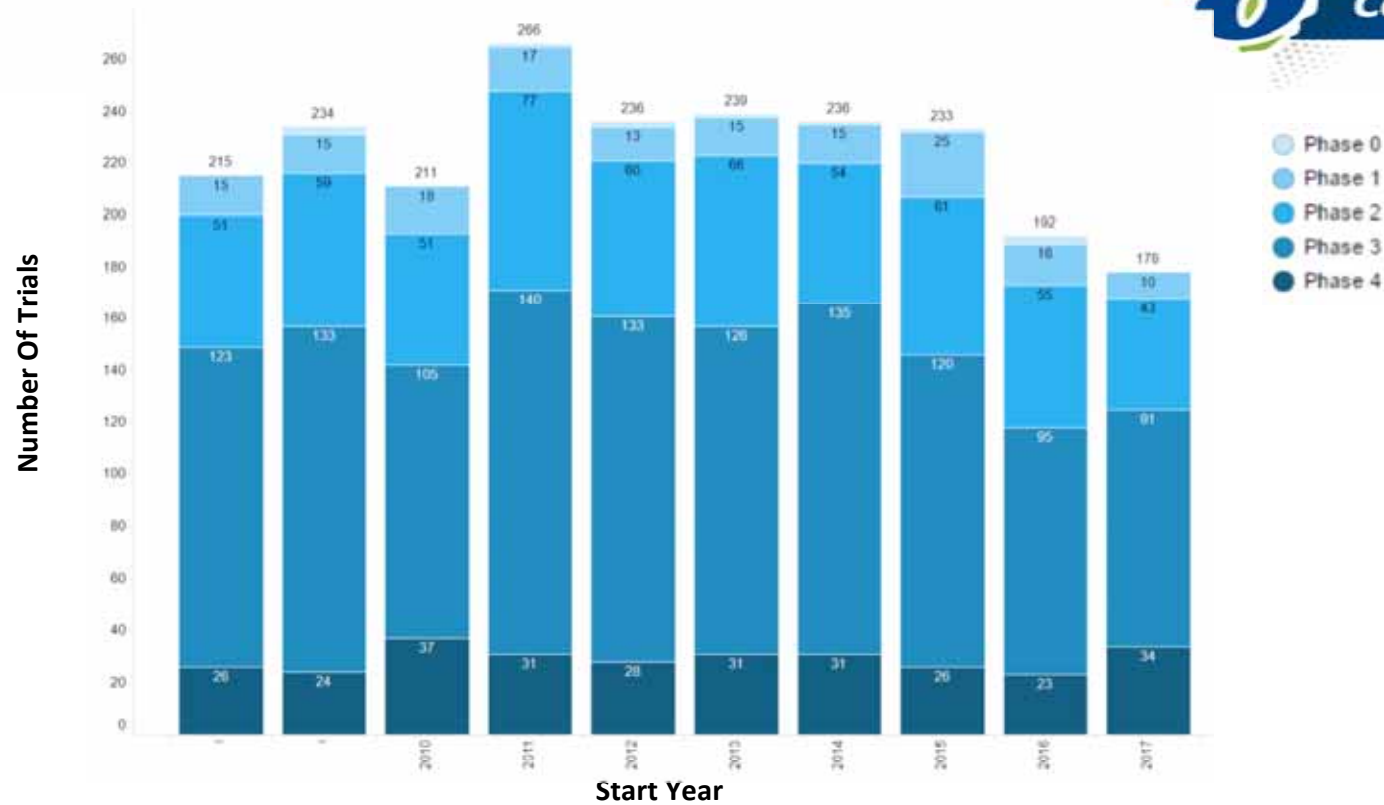


## SSA: Trials Over Last 10 Years



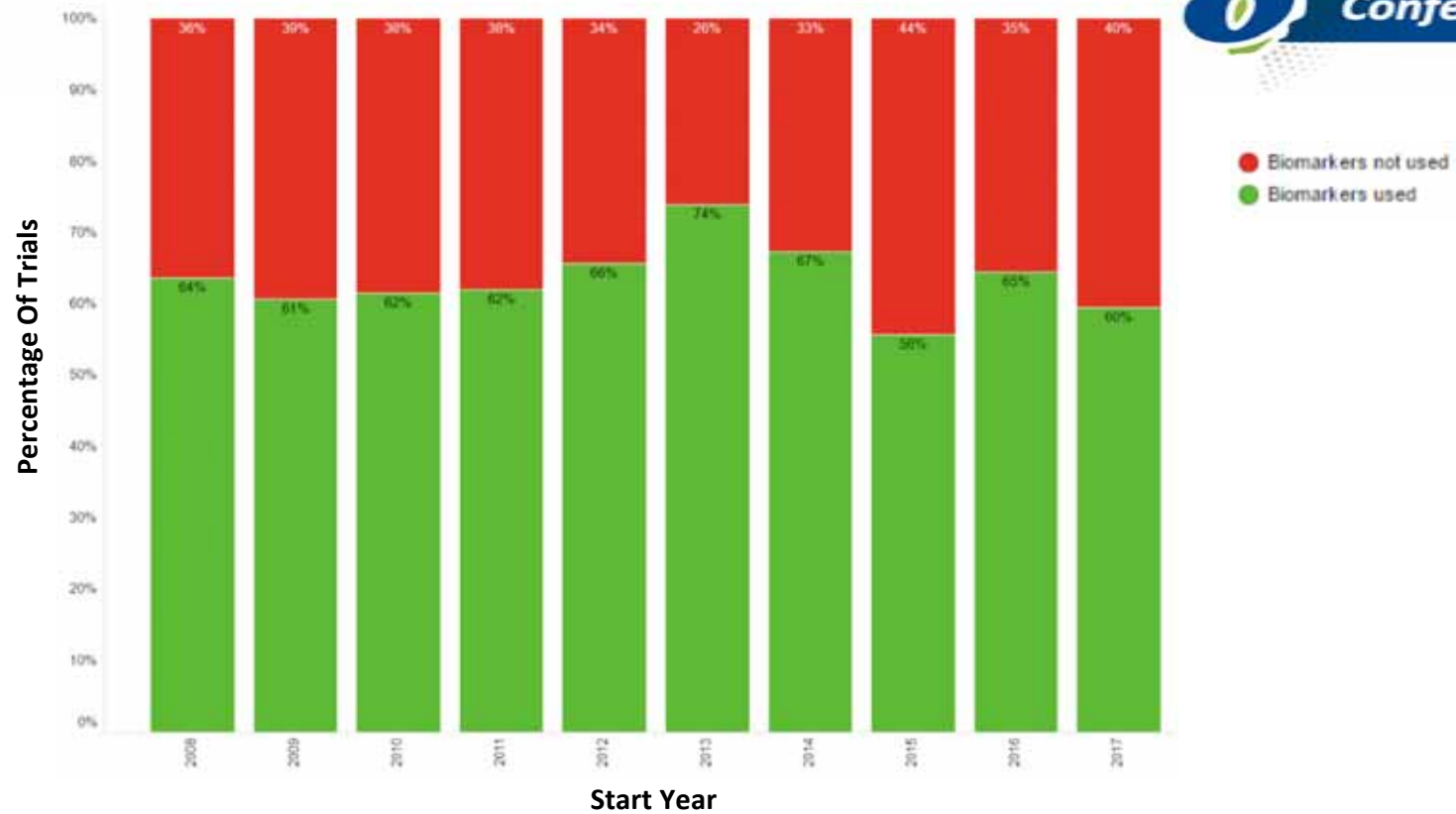
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## SSA: Trials Over Last 10 Years By Phase



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## Biomarker Utilization in SSA



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## The Rise in Utilization of Specific Biomarkers



- Disease marker: The biomarker indicates if a disease already exists (diagnostic biomarker), or how such a disease may develop in an individual case regardless of the type of treatment (prognostic biomarker).
- Therapeutic effect marker: The biomarker gives an indication of the probable effect of treatment on the patient.
- Toxic effect marker: The biomarker indicates a treatment-related adverse reaction.

# Utilization of Specific Biomarkers



Trials Using Biomarkers for Therapeutic Effect



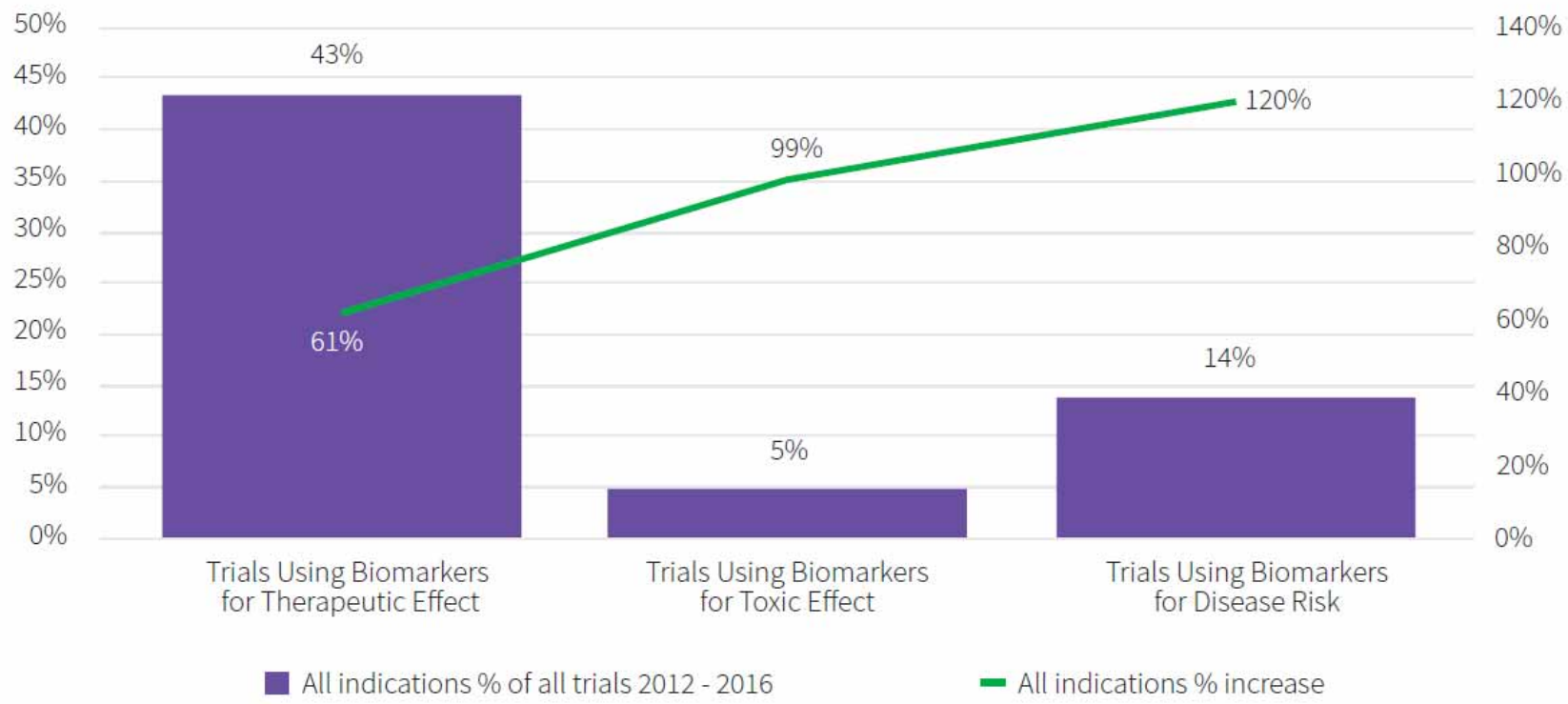
Trials Using Biomarkers for Toxic Effect



Trials Using Biomarkers for Disease Risk

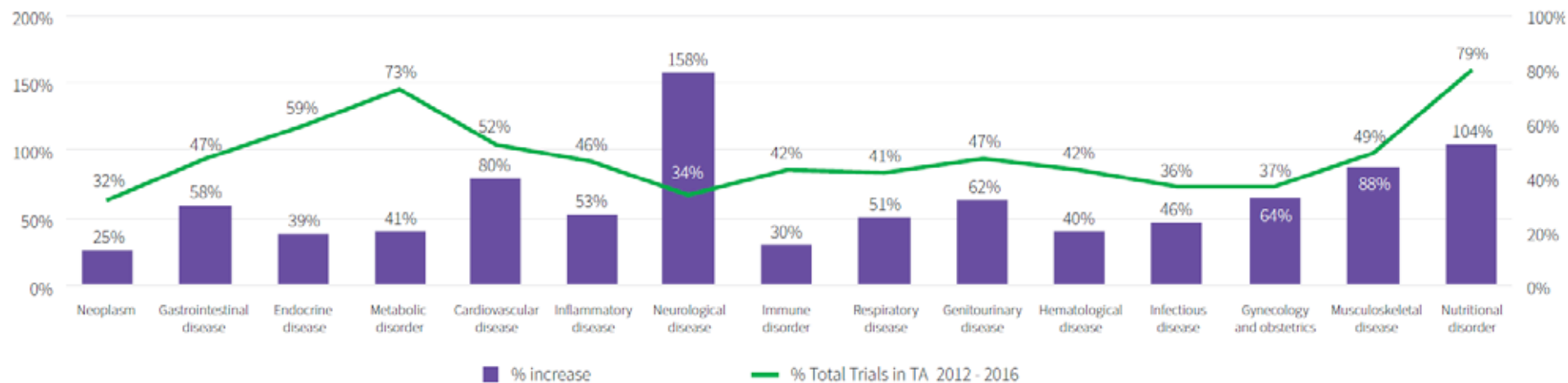


# Specific Biomarker Role Growth



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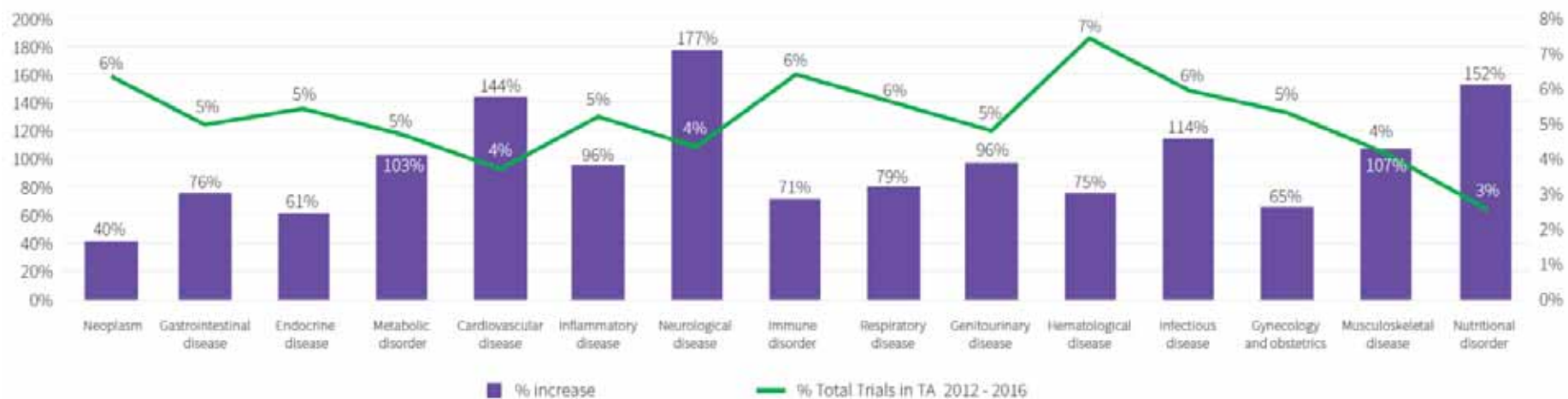
## Growth in Application of Therapeutic Effect Biomarkers



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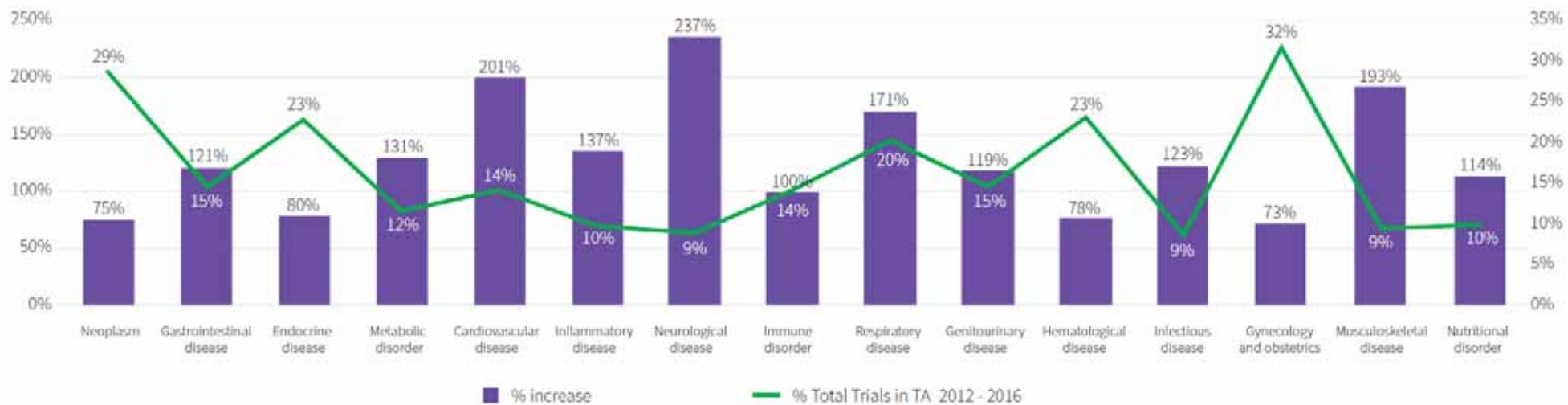


## Growth in Application of Toxic Effect Biomarkers



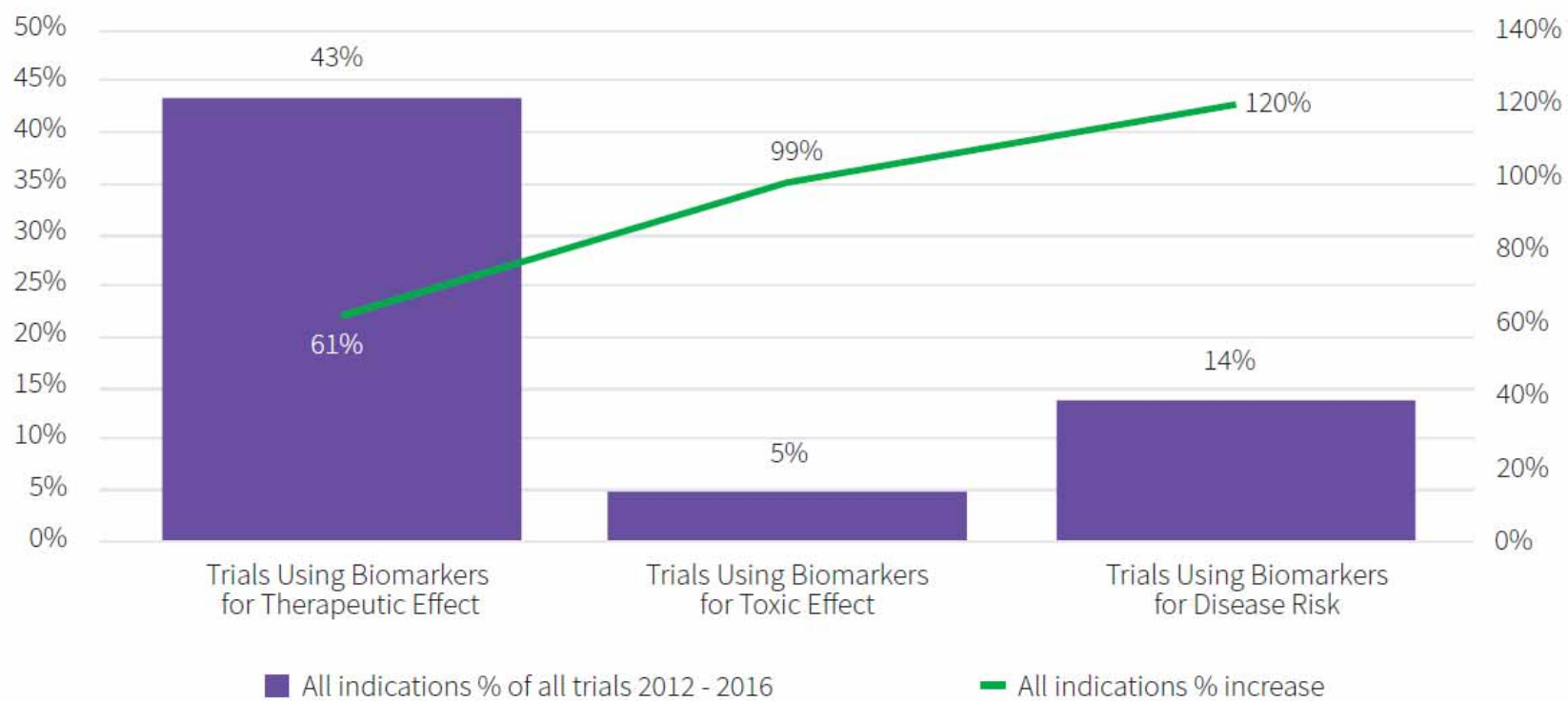
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## Growth in Application of Disease Effect Biomarkers



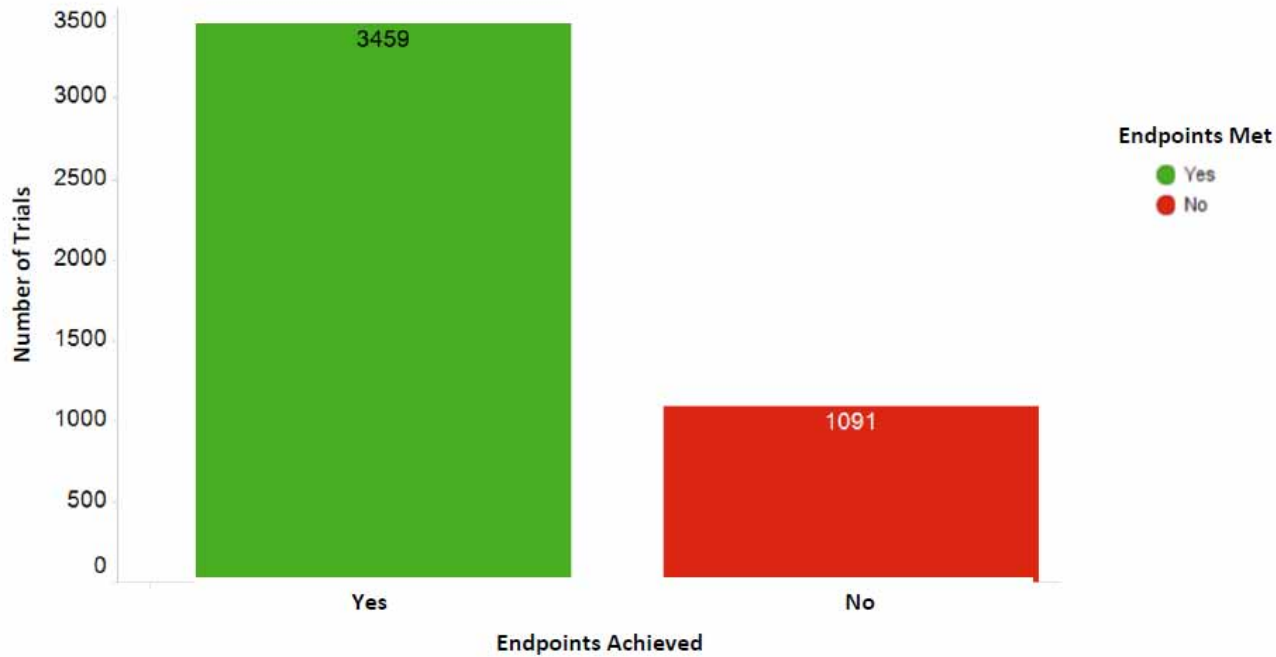
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# Specific Biomarker Role Growth



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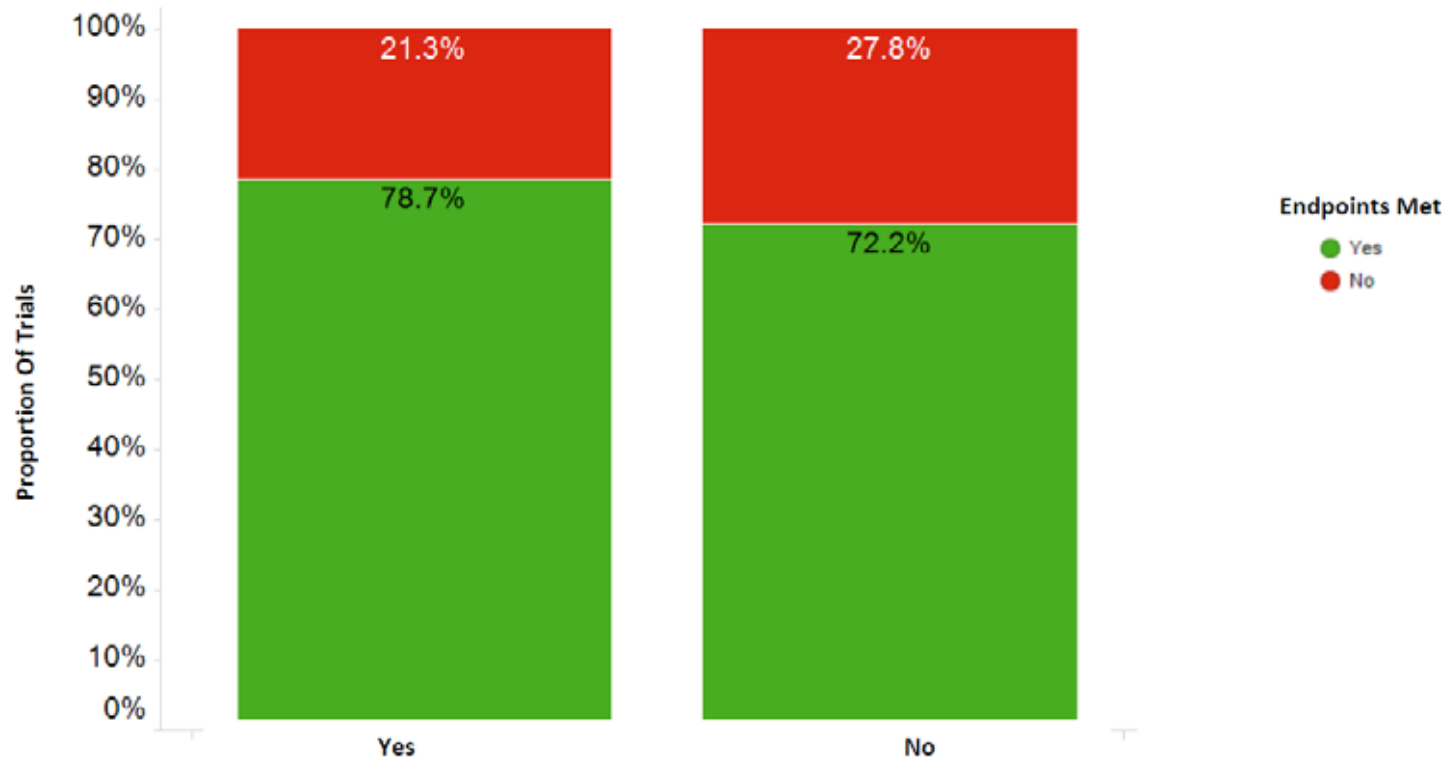
# Trial Endpoint Success Reporting Bias



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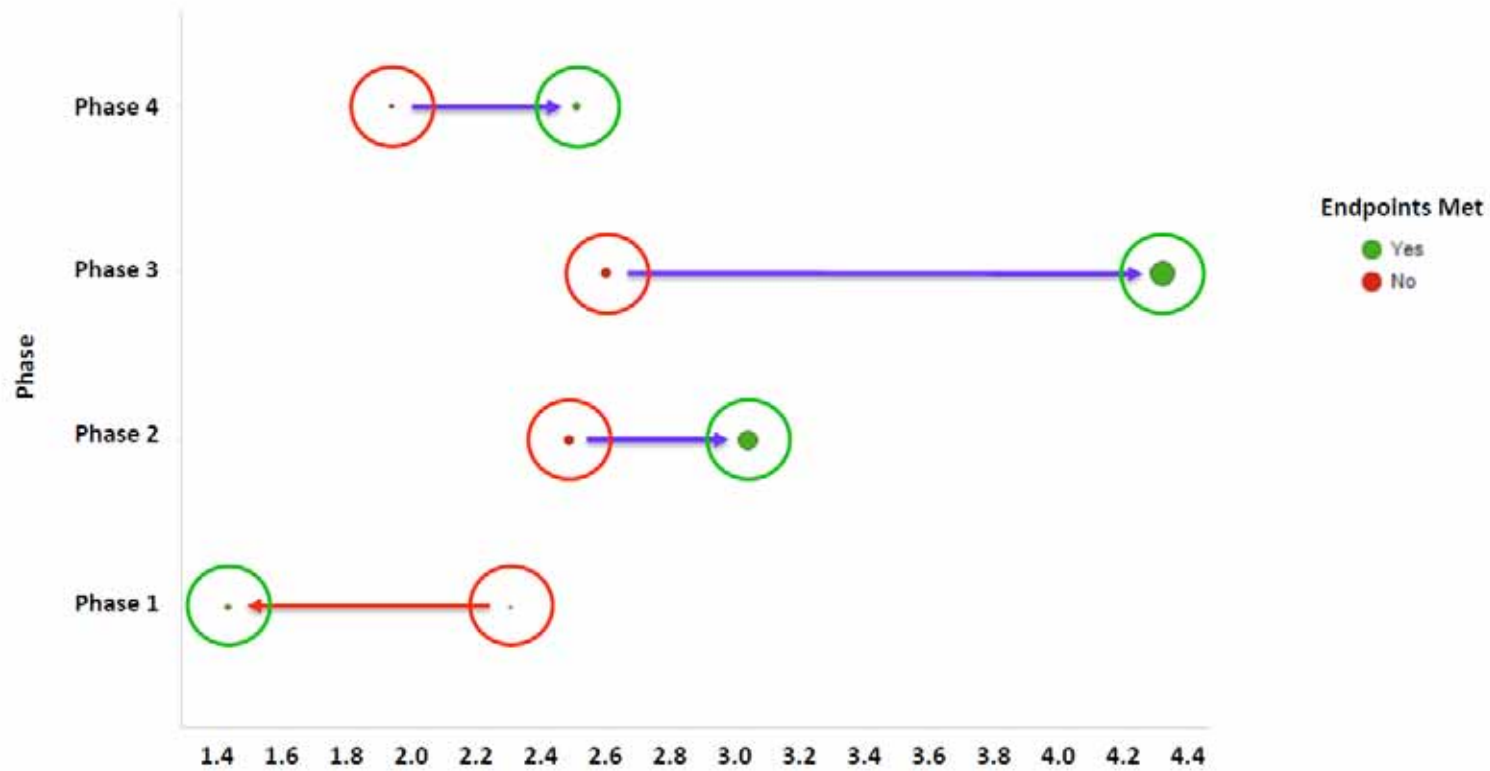


# Biomarkers and Endpoint Trial Success

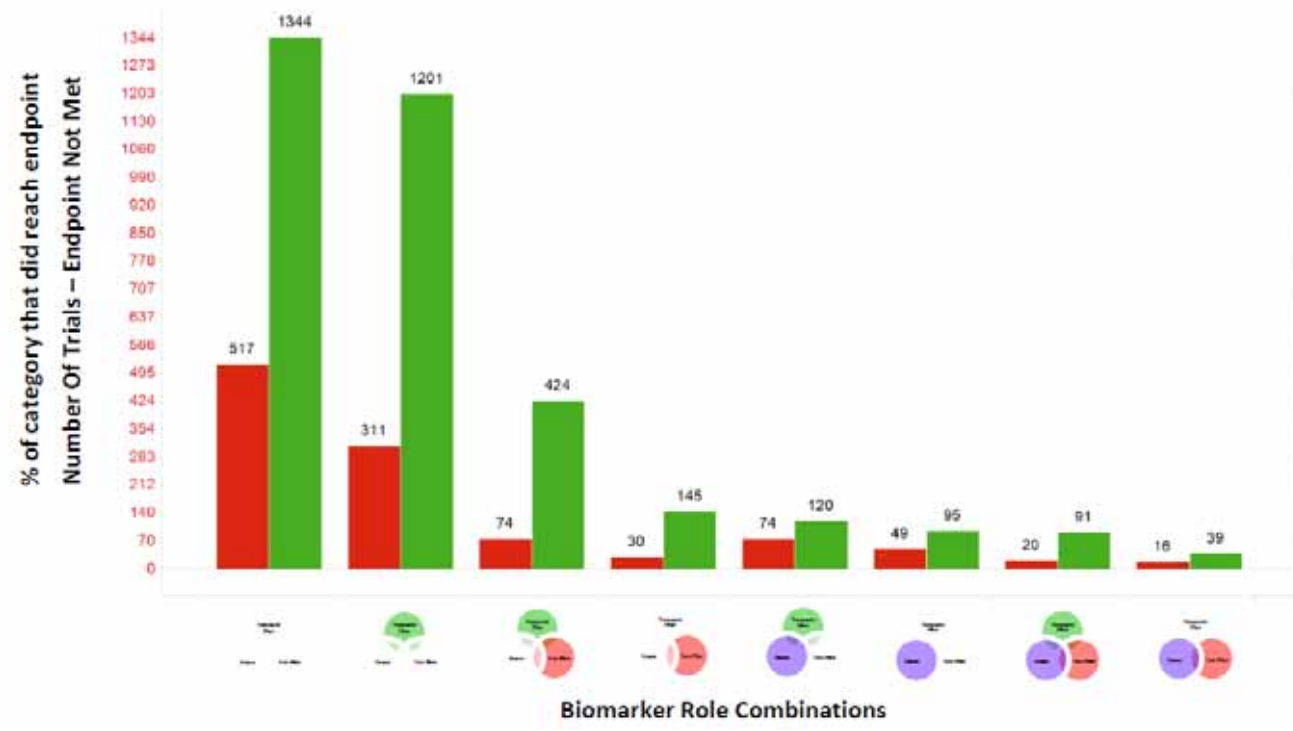


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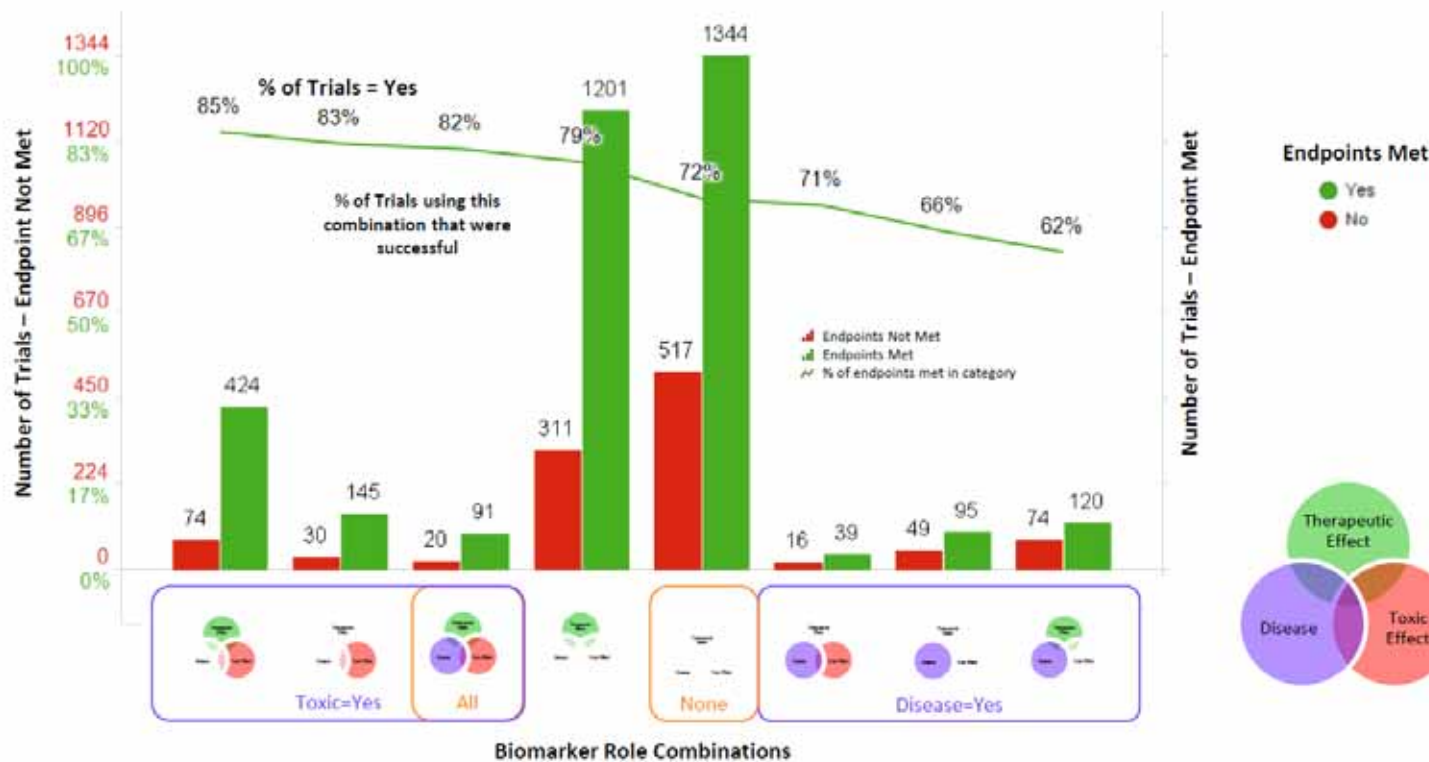
# Average Number of Biomarkers vs Success by Phase



# Segmenting Biomarker Roles



# Endpoint Success in the Application of Specific Biomarkers





Thank you



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## Top 12 Drugs to Watch in 2018



Analysis of 12 new drugs forecast to enter the market in 2018 and achieve blockbuster sales of over \$1 billion by 2022

| RANK | DRUG  | DISEASE                                     | 2018 | 2019  | 2020  | 2021  | 2022  | COMPANY (HQ)                        |
|------|---|---|------|-------|-------|-------|-------|-------------------------------------|
| ★ 1  | <b>Hemlibra</b> (emicizumab) <sup>*,†,‡,§,  </sup>                                      | Hemophilia A with factor VIII inhibitors    | 496  | 1,457 | 2,356 | 3,362 | 4,002 | Roche (Switzerland)/Chugai (Japan)  |
| ★ 2  | <b>Biktarvy</b> (lenofovir alafenamide + emtricitabine + bictegravir) <sup>*,§,  </sup> | HIV Infection                               | 896  | 2,282 | 3,387 | 4,296 | 3,716 | Gilead (U.S.)                       |
| ★ 3  | <b>Ozempic</b> (semaglutide) <sup>*</sup>   | Type 2 diabetes                             | 260  | 862   | 1,576 | 2,583 | 3,469 | Novo Nordisk (Denmark)              |
| 4    | <b>Erleada</b> (apalutamide) <sup>§,  </sup>  | Non metastatic CRPC                         | 25   | 500   | 1,200 | 1,600 | 2,000 | Johnson & Johnson (U.S.)            |
| 5    | <b>Shingrix</b> (zoster vaccine recombinant, adjuvanted) <sup>§§</sup>                  | Shingles                                    | 242  | 537   | 879   | 1,202 | 1,368 | GlaxoSmithKline (UK)                |
| 6    | <b>Patisiran</b> <sup>§,  ,¶,  </sup>   | Hereditary TTR amyloidosis                  | 83   | 373   | 726   | 1,104 | 1,212 | Alnylam (U.S.)/Genzyme (U.S.)       |
| 7    | <b>Epidiolex</b> (plant-derived cannabidiol) <sup>  ,¶,  </sup>                         | Dravet syndrome and Lennox-Gastaut syndrome | 19   | 266   | 645   | 936   | 1,191 | GW Pharmaceuticals (UK)             |
| 8    | <b>Aimovig</b> (erenumab) <sup>*,  </sup>   | Migraine                                    | 115  | 361   | 685   | 941   | 1,170 | Amgen (U.S.)/Novartis (Switzerland) |
| 9    | <b>Lanadelumab</b> <sup>*,  ,¶,  </sup>   | Hereditary angioedema                       | 74   | 350   | 629   | 902   | 1,153 | Shire (Ireland)                     |
| 10   | <b>Elagolix</b> <sup>¶,  ,  </sup>  | Endometriosis                               | 57   | 268   | 549   | 896   | 1,152 | AbbVie (U.S.)                       |
| ★ 11 | <b>Steglatro</b> (ertugliflozin) <sup>  </sup>  | Type 2 diabetes                             | 220  | 482   | 769   | 1,024 | 1,087 | Pfizer (U.S.)/Merck (U.S.)          |
| 12   | <b>Sublocade</b> (once-monthly buprenorphine) <sup>  ,¶,  </sup>                        | Opioid dependence                           | 121  | 308   | 439   | 634   | 1,072 | Indivior (UK)                       |

Data were obtained from the Cortellis Competitive Intelligence database, accessed March 05, 2018 (Source: Thomson Reuters I/B/E/S). Forecasts are in U.S. million. CRPC=castration-resistant prostate cancer. TTR=transthyretin. \*biological drug. †Breakthrough Therapy designation. ‡Fast Track designation. §-RNA interference. ‖-Orphan Drug designation. ¶-Priority Review. \*\*small molecule. ††-nucleoside reverse transcriptase inhibitor. †††-first in class. §§- vaccine.