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Supplementary Materials for

Consortium Sandbox: Building and Sharing Resources

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Supplementary methods

Consortium selection criteria. Inclusion/exclusion criteria were used to select consortia for analysis. Collaborations that were formally labeled as public-private partnerships were not considered as part of the landscape analysis, unless the partnerships met our criteria.

Inclusion	Exclusion
• Temporary integration of researchers from multiple sectors (academia, government, industry, non-profit, clinical care), particularly those that include researchers within the same sector who normally "compete" with each other. • Agreement on a mission that addresses a shared need with a strategic and milestone-driven plan to achieve output that, in turn, can be broadly-used by each stakeholder and the broader scientific community. • Guided by a governance structure that provides each stakeholder with an opportunity to provide input to the partnership's strategic objectives and operations. • Agreed-upon research plan that integrates and leverages the research resources, finances, and expertise from each participant and sponsor. • Development of shared and permanent research resources, such as standardized reagents, cell-lines, combinatorial libraries and biospecimens, were included since multiple stakeholders must agree on a timeline, governance structure, contribution, and access rules. • Neutral organizations that convene multiple stakeholders on a longer-term basis to sponsor and manage temporary, collaborative research projects (mini-consortia) on an on-going basis.	• Professional organizations that serve to advocate on behalf of a specific industry, such as a trade organization. • Collaborations used to create or evaluate a medical product that will benefit of only one entity or organization, without objectives to create or disseminate broadly generalizable information, such as new clinical trial methods. • Cohort of investigators that convene only as part of an investigator's meeting, without governance to coordinate and integrate their research activities towards a primary objective.

Classification of scientific objectives of consortia

(i) Fundamental or basic research: Foundational scientific knowledge that is not directly linked to a specific application or product (biological pathways, mechanisms of action for a class of molecules, disease-progression studies, genetic and genomic association maps)
(ii) Tools: Research resources (biobanks, compound libraries, cell lines, standardized reagents); research framework and methodologies (*in silico* toxicology prediction,

clinical trial methods, collaborative processes); and data-sharing enablers (standards, ontologies, interoperability methodologies)
(iii) Biomarkers: Measurable indicators of normal biological processes, pathological processes, or pharmacological response to an intervention (*6*). Although this type of research could be considered as tool development or fundamental research, we made this a separate category to allow for deeper analysis.
(iv) Specific products: Research technologies or medical products (broad companion diagnostics for a class of drugs, information technology frameworks that link electronic health records with biomedical research, therapeutics for rare or neglected diseases, assays to determine the toxicity for a class of drugs)

Information gathering

We used publicly available information from Web sites, press releases, publications, and presentations as well as phone-based interviews of a select group of consortia to pinpoint the consortia's goals and motivation, operational framework, accomplishments, and challenges. In our analysis, we considered each consortium as an equivalent data point and did not account for the size, duration, success, finances, demographics of participants, or availability of resources. Thus, consortia with a small number of participants and minimal resources were considered equivalent to the larger consortia, as long as they met the criteria described above.

Consortia adhere to differing levels of transparency, we sought to identify those that both met our criteria (see above) and provided enough detail to be included in our analysis (Fig. 1; 369 consortia). Some of the 369 consortia that we catalogued were no longer active at the time this report was written. For example, the Observational Medical Outcomes Partnership recently concluded its activities in 2013, after meeting all of its milestones and deliverables (*28*)

Table S1. Consortium Web sites. Consortia are listed in the order in which they appear in the main text.

Consortia	URL
Biomarkers For Enhanced Vaccine Immunosafety	www.biovacsafe.eu
FasterCures Consortiapedia program	http://fastercures.org/consortiapedia
Innovative Medicines Initiative	www.imi.europa.eu
Critical Path Instiute	www.c-path.org
Foundation for the National Institutes of Health (fNIH)	www.fnih.org
FNIH Observational Medical Outcomes Partnership	http://omop.fnih.org
European Commission Seventh Framework Programme	http://ec.europa.eu/research/fp7/index_en.cfm
TransCelerate Biopharma	www.transceleratebiopharmainc.com

Quebec Consortium for Drug Discovery	www.cqdm.org/en/index.php
Biomarkers Consortium general intellectual property and data-sharing principles	www.biomarkersconsortium.org/policies_ip.php
International Mouse Phenotyping Consortium	www.mousephenotype.org
Clinical Decision Support Consortium	www.partners.org/cird/cdsc
Innovation in Medical Evidence Development and Surveillance	http://imeds.reaganudall.org
U.S. National Institutes of Health, Accelerating Medicines Partnership	www.nih.gov/science/amp/index.htm
Prostate Cancer Molecular Medicine	www.pcmmproject.org
Mammary Carcinoma Molecular Imaging for Diagnosis and Therapeutics	www.ctmm.nl/en/projecten/kanker/mammoth
Worldwide Innovative Networking in personalized cancer medicine consortium	www.winconsortium.org
Myelin Repair Foundation	www.myelinrepair.org/research_model
International Rare Disease Research Consortium	www.irdirc.org
Coalition for Accelerating Standards and Therapies	http://c-path.org/programs/cfast
Alzheimer's Disease Neuroimaging Initiative	www.adni-info.org
DIabetes REsearCh on patient straTification	www.direct-diabetes.org
Beta Cell Biology Consortium	www.betacell.org
Observational Medical Outcomes Partnership, Common Data Model	http://omop.org/CDM
Reagan-Udall Foundation	www.reaganudall.org

Table S2. Sectors or groups that initiate consortia through the development of strategic research agendas. We did not consider funding organizations as initiating parties unless these groups were the original creators of the overarching scientific mission. For example, IMI serves as a third-party administrator for consortia and is supported by a public-private partnership between the European Commission and the pharmaceutical industry. We considered the majority of consortia under the IMI umbrella to be industry-initiated, because the overarching scientific research agenda was created by the pharmaceutical industry trade organization, European Federation of Pharmaceutical Industries and Associations.

Sector or group	Broad characteristics	General expectations	Example consortia
Academia	• Non-profit research institutions and universities • Basic and early-stage research • Clinical research • Serve as authority with tools and expertise to advance basic and clinical sciences	• Coordinate basic research to support the advance of a specific discipline/tool • Enhance data-exchange across institutions • Increase partnerships with other sectors to access additional resources • Provide opportunities to advance science through publications/presentations	• Academic Drug Discovery Consortium • Clinical Trials Transformation Initiative • Global Alliance for Genomics and Health
Government	• Responsible for tax-payer resources • Federal/regional/local agencies • Responsible for advancing science and/or stimulating economic growth	• Address gap in R&D infrastructure • Lower the risk for translating innovative scientific concepts / methods towards an application • Advance efforts to strengthen regulatory responsibilities • Maintain or increase competitiveness and sustainability of research sectors • Create jobs and companies	• Centre for Drug Safety Science • Accelerating Medicines Partnership • Predictive Safety Testing Consortium
Health care organization	• Responsible for delivery of health care to patients	• Develop interoperable electronic health systems • Advance methods for improving costs and quality of patient care	• Care Connectivity Consortium • Chronic Care Collaborative Network • Clinical Decision Support Consortium
Industry	• Research for	• Address operational	• TransCelerate

	development of medical products • For-profit business strategy	inefficiencies • Lower the risk for introducing innovation • Lower the risk for entering new disease markets • Maintain or increase competitiveness and sustainability • Harmonize regulatory practices through standards and tools development	BioPharma • Biomarkers for Enhanced Vaccines Immunosafety • Pistoia Alliance
Patient organization or nonprofit foundation	• Non-profit, non-government organizations • Advance research on specific disease or condition • Non-disease organizations may have interests to improve regional/state economy	• Accelerate drug development research for their disease of interest • Create research resources to accelerate basic research and fundamental knowledge in disease of interest • Create jobs and companies	• Parkinson's Disease Research Tools Consortium • Multiple Myeloma Research Consortium • Polycystic Kidney Disease Outcomes Consortium
Third-party organization	• Non-profit, non-government organizations • "Neutral" status, not-affiliated, and not-partial to specific sector or stakeholder • Project management expertise • Understands how to leverage the strengths of different research sectors and organizations • Reputation for convening multiple organizations across sectors in collaboration	• Identify broad and unmet scientific needs, develop strategies for solution • Create tools that can be broadly used to accelerate research in one, or multiple, sectors • Advance societal interests, such as economic growth or improved public health	• Clinical Data Interchange Standards Consortium • Coalition Against Major Diseases • Biomarkers Consortium

Table S3. Examples of consortium output

Consortium	**Deliverable** (year)	**Utility**	**Reference**
Observational Medical Outcomes Partnership	Common data model and vocabulary (2012)	Standardize the format and content of observational patient data collected in the clinic, to advance integration of diverse data sources for post-market surveillance of medical products	Observational Medical Outcomes Partnership (*28*)
Coalition Against Major Diseases	Alzheimer's disease clinical trial simulation tool (2012)	Optimize design of therapeutic clinical trials for mild and moderate Alzheimer's disease – qualified by US Food and Drug Administration and European Medicines Agency	(*29*)
TransCelerate BioPharma	Risk Assessment and Categorization Tool, Training materials (2014)	Standardize integration of risk-mitigation strategies into design and implementation of clinical trials	TransCelerate BioPharma (*30*)
Parkinson's Progression Markers Initiative	De-identified and longitudinal clinical, imaging and biomarker data, including MRI and SPECT images (on-going, launched in 2011)	Database for research community to advance biomarker research on Parkinson's disease	Michael J. Fox Foundation for Parkinson's Research (*31*)