

NIH Common Fund: How NCI Participates and Benefits

**Dinah Singer, PhD
Christine Siemon
Division of Cancer Biology**

I. How NCI Participates

- **Development**
- **Implementation**
- **Management**

Development of Common Fund Proposals

NIH OD solicits new Common Fund proposals from ICs

IC staff from Divisions, Offices and Centers, in conjunction with other ICs, develop proposals based on novel scientific opportunities

Proposals are discussed and evaluated by NCI Scientific Program Leaders based on:

- Scientific merit**
- Cancer relevance**
- Relevance to the mission of other ICs**
- Feasibility**

Selected proposals are forwarded to the NIH OD for further consideration

Development of Common Fund Proposals (FY14)

Proposals from NCI staff	NCI proposals forwarded to Common Fund for consideration *	NCI proposals selected for Common Fund
Environmental Gradients in Health and Disease		
Mapping Genetic Networks in Cancer		
Implementation of Laser Dissection in the Clinic		
Functional Understanding of Biological Processes and Translational Opportunities using Synthetic Biology		
Support for User Access to Mouse Population Genetic Resources	Support for User Access to Mouse Population Genetic Resources	
Enabling Research of Chronic Disease Associations		
Management of Chronic Diseases in Clinical Trials	Management of Chronic Diseases in Clinical Trials	
Role of Inflammation in Chronic Diseases		
Obesity and Diseases		
Imaging to Augment Research in Genetic Variation of Disease	Imaging to Augment Research in Genetic Variation of Disease	
Combining Cohorts for Full Spectrum of		

Development of Common Fund Proposals (FY15)

NCI Proposals from NCI staff	NCI proposals forwarded to Common Fund for consideration *	NCI proposals selected for Common Fund
3D NUCLEOME	3D Nucleome (changed to 4D Nucleome)	4D Nucleome
Trans-NIH Initiative in RNA Biology		
Cachexia – defining measures, triggers, and metabolic reprogramming to develop early interventions	Cachexia – defining measures, triggers, and metabolic reprogramming to develop early interventions	
Dispersive Microenvironments for Disease		
Next Generation Synthetic Biology Research Tools for Hypothesis Testing and Clinical Application ^		
The intersections between diseases		
Support for access to, and use of, the Collaborative Cross and Diversity Outbred Mice^		

Development of Common Fund Proposals (FY16)

Proposals from NCI staff	NCI proposals forwarded to Common Fund for consideration	NCI proposals selected for Common Fund
Therapeutic Targeting of Regulatory RNAs ^	A Structural Basis for RNA Therapy	TBD
NIH initiative on cellular reprogramming		TBD
The Human Metaorganism in Biology and Medicine		TBD
Liver fibrosis: causes, consequences, prevention, and treatment	Fibrotic Diseases: causes, consequences, prevention, and treatment	TBD
Mobile Health (mHealth) Technologies	Mobile Health (mHealth) Technologies for Medical Diagnostics in NIH Mission Areas (SBIR/STTR)	TBD
Cellular Engineering: Building the Toolbox for Understanding Complex Biological Systems and for the Next-Generation Therapeutics^	Next-Generation Cell Engineering: Producing the Toolbox for Designing, Building, and Understanding Complex Biological Systems for Novel Diagnostics and Therapeutics	TBD

NCI Initiatives Arising From Proposals Not Selected for Common Fund

NCI Common Fund Proposal	Resulting NCI Initiative
Management of Chronic Diseases in Clinical Trials	PQ Question
Strategies to Augment Research in Genetic Variation of Disease	PQ Question
Cachexia	PQ Question
Role of Inflammation in Chronic Diseases	PQ Question
Obesity and Diseases	PQ Question
Permissive Microenvironments for Disease	PQ Question

CI Staff Participation in Common Fund Programs

Big Data to Knowledge

Bioinformatics and Computational
Biology
Bridging Interventional Development
Gaps (BrIDGs) (formerly RAID)
Building Blocks, Biological Pathways and
Networks
Epigenomics

Extracellular RNA Communication (Exosomes)

Genotype-Tissue Expression (GTEx)
Global Health
Health Care Systems Research
Collaboratory
Health Economics
HIGH-RISK RESEARCH
Human Microbiome Project (HMP)
Knock out Mouse Phenotyping (KOMP2)
Library of Integrated Network-Based

- **Metabolomics**
- Molecular Libraries and Imaging
- Nanomedicine
- NIH Center for Regenerative
Medicine (NIH CRM)
- PROMIS: Patient-Reported
Outcomes Measurement
Information System
- **4D Nucleome**
- Protein Capture Reagents
- Regulatory Science
- Science of Behavior Change
- Single Cell Analysis
- Structural Biology
- Undiagnosed Diseases

II. How NCI Benefits

How NCI Benefits From the Common Fund

- **Development of New Resources**
- **Growth of Cancer Research in New Areas**
- **Recruitment and Training of Cancer Researchers in New Areas**

How NCI Benefits From the Common Fund

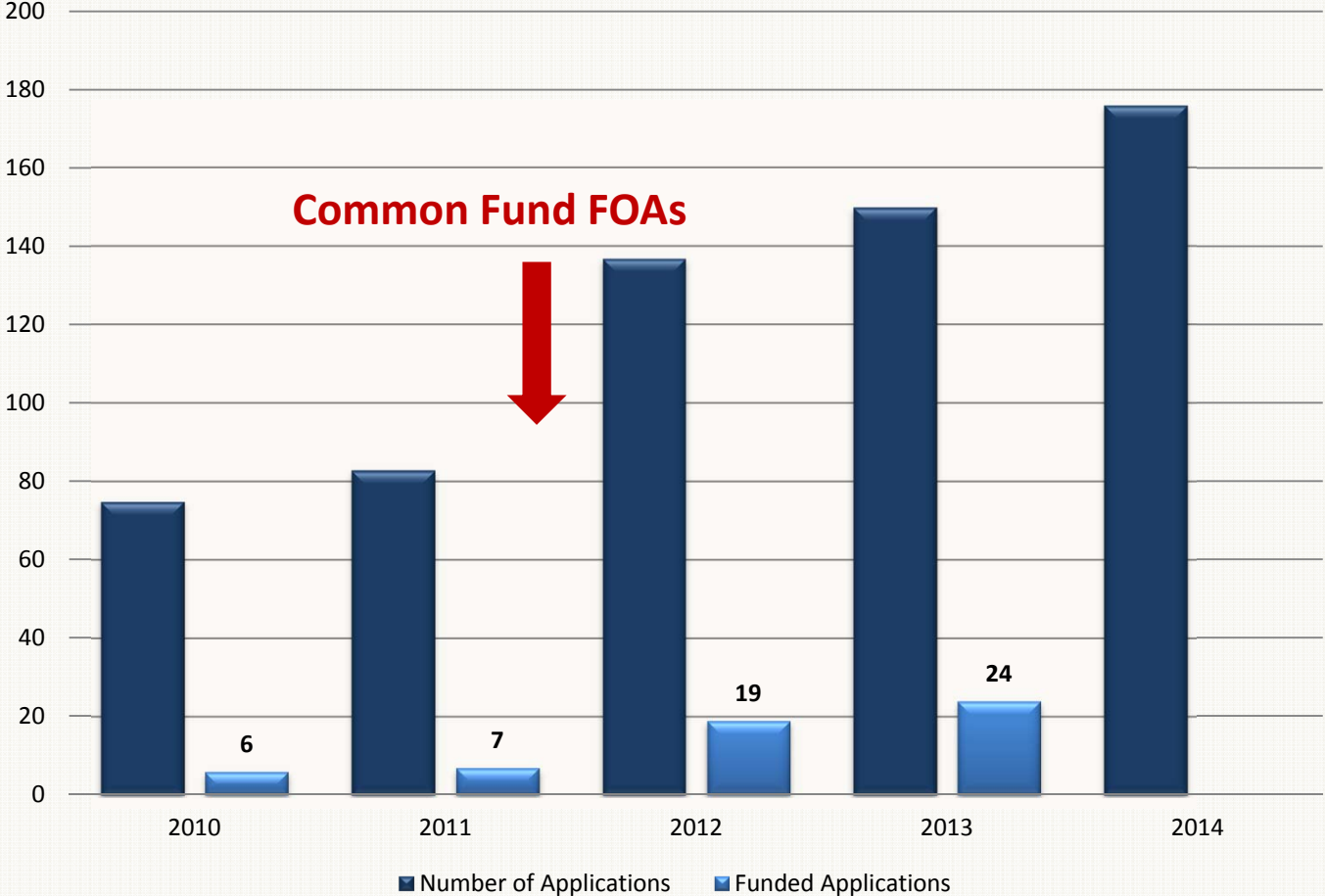
- **Development of New Resources**
 - **Molecular Libraries and Screening Centers**
 - **Extracellular RNA Catalog**
 - **LINCS Datasets (Library of Integrated Network-based Cellular Signatures)**
 - **Metabolomics Resource Cores**
 - **Microbiome Datasets**
- **Growth of Cancer Research in New Areas**

- **Recruitment and Training of Cancer Researchers in New Areas**

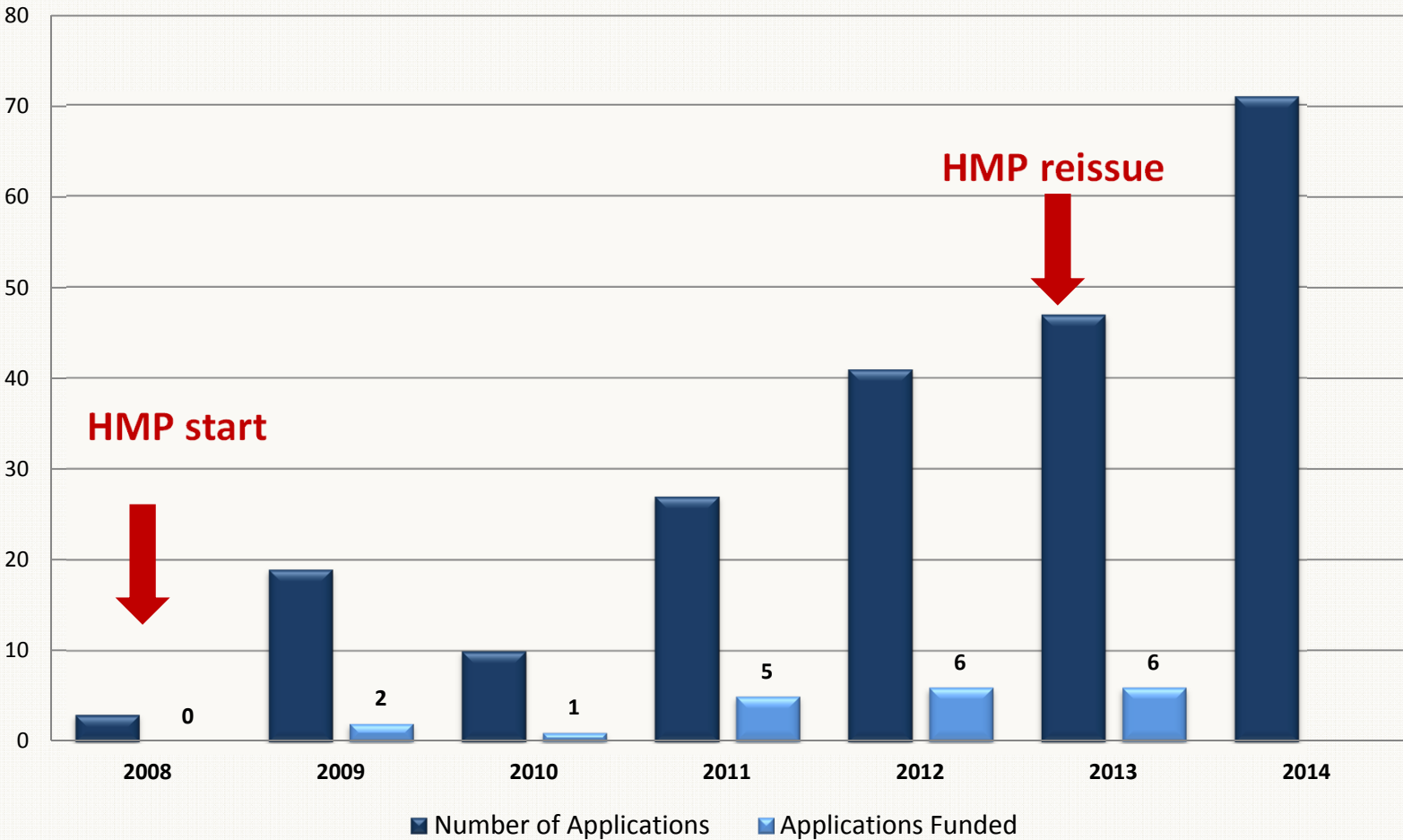
How NCI Benefits From the Common Fund

- **Development of New Resources**
 - **Molecular Libraries and Screening Centers**
 - **Extracellular RNA Catalog**
 - **LINCS Datasets (Library of Integrated Network-based Cellular Signatures)**
 - **Metabolomics Resource Cores**
 - **Microbiome Datasets**
- • **Growth of Cancer Research in New Areas**
 - **High-throughput screening for novel therapeutics**
 - **Cancers systems biology**
 - **Cancer metabolomics**
 - **Cancer microbiome**
- **Recruitment and Training of Cancer Researchers in New Areas**

Growth of the NCI Metabolomics Portfolio



Growth of NCI's Microbiome Portfolio



How Does NCI Benefit From The Common Fund?

- **Development of New Resources**
 - **Molecular Libraries and Screening Centers**
 - **Extracellular RNA Catalog**
 - **LINCS Datasets (Library of Integrated Network-based Cellular Signatures)**
 - **Metabolomics Resource Cores**
 - **Microbiome Datasets**
- **Growth of Cancer Research in New Areas**
 - **High-throughput screening for novel therapeutics**
 - **Cancers systems biology**
 - **Cancer metabolomics**
 - **Cancer Microbiome**
- • **Recruitment and Training of Cancer Researchers in New Areas**

Common Fund High Risk/High Reward Programs: NCI Funding FY2012-2013

High Risk High Reward Research in FY 2012-13	Awarded with NCI assignment (Total IC)
NCI Director's Early Independence Award (EIA)	6 (30)
NCI Director's New Innovator Award	14 (92)
NCI Director's Pioneer Award	12 (93)
NCI Director's Transformative Research Awards	5 (30)

NIH Common Fund: NCI Participates and Benefits

Questions?

NIH Common Fund

Common Fund programs are intended to be:

- **Transformative**: Must have high potential to significantly advance biomedical and/or behavioral research
- **Cross-cutting**: Program areas must be relevant to multiple diseases or conditions, and be sufficiently complex to require a coordinated, trans-NIH approach
- **Unique**: Must be something no other entity is likely or able to do

4D Nucleome

Higher resolution and higher throughput technologies to study nuclear organization at different scales;

Computational analysis and visualization tools for 4D Nucleome data;

Reference maps of human 4D Nucleomes for human cells and tissues;

A detailed understanding of:

- the physical principles and regulatory mechanisms of nuclear organization;**
- the relationship between organization and cell function;**
- the role of poorly-described nuclear structures.**

Library of Integrated Network-Based Cellular Signatures (LINCS)

The LINCS program aims to develop a “library” of molecular signatures that describes how different types of cells respond to a variety of perturbing agents. The pilot phase of the program focuses on the following activities:

- Large-scale production of perturbation-induced molecular and cellular signatures
- Creation of a database, common data standards and public user interface for accessing the data
- Computational tool development and integrative data analyses
- Development of new cost-effective, molecular and cellular phenotypic assays
- Integration of existing datasets into LINCS

Website: <http://commonfund.nih.gov/LINCS/>

Human Microbiome Project

The NIH Human Microbiome Project is one of several international efforts designed to take advantage of large scale, high through multi 'omics analyses to study the microbiome in human health.

The first phase of HMP (FY2007-2012) had six Initiatives which focused on the development of metagenomics datasets and computational tools for characterizing the microbiome in healthy adults and in cohorts of specific microbiome-associated diseases

The second phase of HMP (FY2013-2015) is focused on one Initiative which will create the first ever integrated datasets of biological properties from both the microbiome and the host using multi 'omics technologies

Website: <http://commonfund.nih.gov/hmp>

Extracellular RNA Communication (Exosomes)

This program aims to:

- Discover fundamental biological principles about the mechanisms of exRNA generation, secretion, and transport;
- To identify and develop a catalog of exRNA found in normal human body fluids;
- To investigate the potential for using exRNAs in the clinic as therapeutic molecules or biomarkers of disease
- NCI funds 5 Common Fund grants in response to this initiative

The NIH Common Metabolomics Program

Program Structure

- Consortium with service cores, a data repository, and a coordinating center associated with technology development R01s, training mechanisms, and reference standards synthesis contracts.
- Funding – ~\$100M between FY2012-17
- <http://commonfund.nih.gov/metabolomics/index>

Program Goals

- Increase the national metabolomics capacity in specialized facilities that provide high quality data, analyses, and interpretation.
- Train a new generation of scientists in metabolomics with the skills in technology, biochemistry and physiology needed for metabolomics studies.
- Increase availability of metabolite standards for identification and quantification.
- Develop new technologies that increase the number of Unique Chemical Entities detected and throughput while reducing sample volume and cost
- Coordinate with the international community to generate a comprehensive database for metabolomics

Examples of Outcomes from Common Fund Initiatives

Common Fund Programs	New Tools and Methods	Databases and Libraries	High Throughput Analyses	Translational	Population Science	Training
Extracellular RNA Communication	×	×		×		
Library of Integrated Network-Based Cellular Signatures (LINCS)	×	×	×			
Metabolomics	×	×	×	×		×
Human Microbiome Project	×	×		×		