

Human Heredity and Health in Africa (H3Africa)

NIH Common Fund Program



H3Africa
Human Heredity and Health in Africa



H3Africa



Overall vision: *To enhance capacity for using contemporary research approaches, in Africa by African scientists, to understand the genetic and environmental factors that determine disease susceptibility and drug responses in African populations.*

- Increase the number of internationally competitive African scientists in genomics and population-based research
- Establish collaborative networks of African investigators
- Create and expand infrastructure for genomics research
- Support the ongoing policy development for ethical issues in genomics research, particularly in an African context

High-risk/high-reward with long-term goals

Current H3Africa Footprint

- ★ H3ABioNet
 - Nodes (32)
- ★ Biorepositories (3)
 - Collection sites
- ★ Collaborative Centers (5 NIH)
 - Collection sites
- ★ Independent Research (7)
 - Collection sites
- ★ ELSI Research (6)
 - Interview sites
- ★ Collaborative Centers (3 WT)
 - Collection sites



Governance

Oversight

Working groups

Policies and guidelines

Independent Expert Committee

Steering Committee

Data & Biospecimen Access Committee



Steering Committee

Ethics and Regulation

Phenotype harmonization

Genome analysis

Biorepositories

Data sharing, access & release

Study coordinators

Education and training

Publications

Outreach and communication

Guidelines

Informed consent

Community engagement

Policies

Publication

Data & specimen access and sharing

www.h3a.org

H3Africa: Major Accomplishments

The epigenome of *Trypanosoma brucei*: A regulatory interface to an unconventional transcriptional machine

Johannes P. Maree, Hugh -G. Patterson  

A Call for Policy Action in Sub-Saharan Africa to Rethink Diagnostics for Pregnancy Affected by Sickle Cell Disease: Differential Views of Medical Doctors, Parents and Adult Patients Predict Value Conflicts in Cameroon

Wonkam Ambroise and Hurst Samia

OMICS: A Journal of Integrative Biology.

VIRAL EVOLUTION

Genomic surveillance elucidates Ebola virus origin and transmission during the 2014 outbreak

Stephen K. Gire,^{1,2*} Augustine Goba,^{3*†} Kristian G. Andersen,^{1,2*†} Rachel S. G. Sealfon,^{2,4*} Daniel J. Park,^{2*} Lansana Kanneh,³ Simbirie Jalloh,³ Mambu Momoh,^{3,5} Mohamed Fullah,^{3,5,†} Gytis Dudas,⁶ Shirlee Wohl,^{1,2,7} Lina M. Moses,⁸ Nathan L. Yozwiak,^{1,2} Sarah Winnicki,^{1,2} Christian B. Matranga,² Christine M. Malboeuf,² James Qu,² Adrienne D. Gladden,² Stephen F. Schaffner,^{1,2} Xiao Yang,² Pan-Pan Jiang,^{1,2} Mahan Nekoui,^{1,2} Andres Colubri,¹ Moinya Ruth Coomber,³ Mbalu Fonnle,^{3,†} Alex Moigboi,^{3,†} Michael Gbakie,³ Fatima K. Kamara,³ Veronica Tucker,³ Edwin Konuwa,³ Sidiki Saffa,^{3,†} Josephine Sellu,³ Abdul Azziz Jalloh,³ Alice Kovoma,^{3,†} James Koninga,³ Ibrahim Mustapha,³ Kandeh Kargbo,³ Momoh Foday,³ Mohamed Yillah,³ Franklyn Kanneh,³ Willie Robert,³ James L. B. Massally,³ Sinéad B. Chapman,² James Bochicchio,² Cheryl Murphy,² Chad Nusbaum,² Sarah Young,² Bruce W. Birren,² Donald S. Grant,³ John S. Scheffelin,⁸ Eric S. Lander,^{2,7,9}

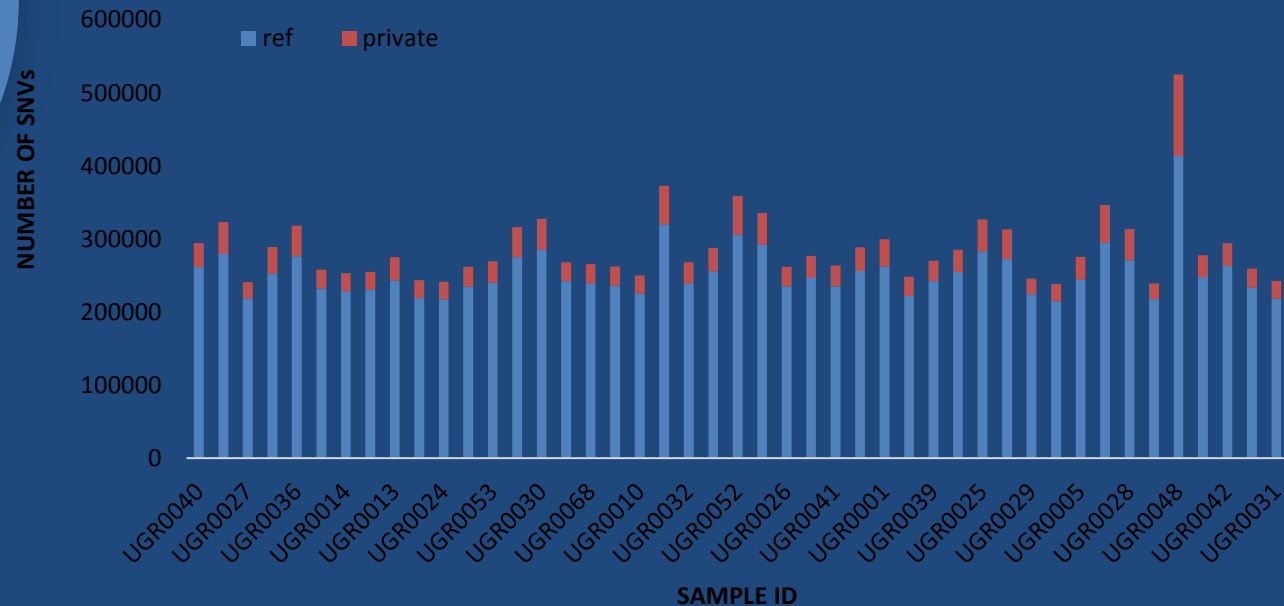
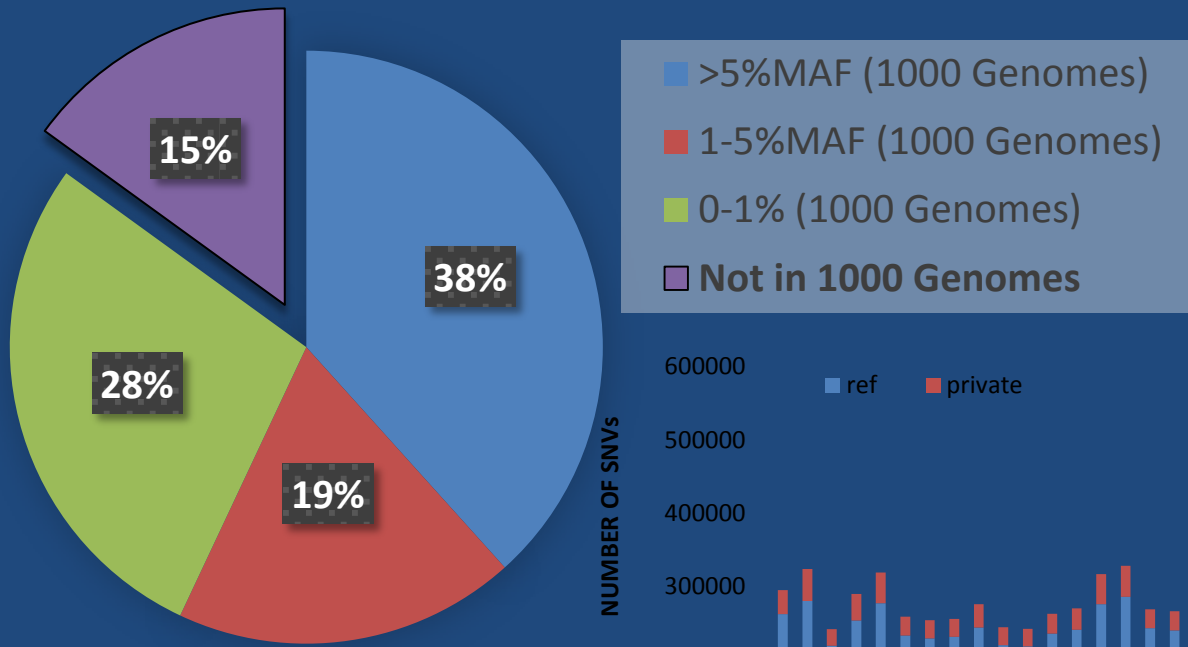
The H3Africa policy framework: negotiating fairness in genomics

Jantina de Vries¹, Paulina Tindana², Katherine Littler³, Michèle Ramsay⁴, Charles Rotimi⁵, Akin Abayomi⁶, Nicola Mulder⁷, and Bongani M. Mayosi⁸

Sustainability: leveraging resources and building interest

CAFGen – Gabriel Anabwani, Botswana

Distribution of SNVs in Uganda

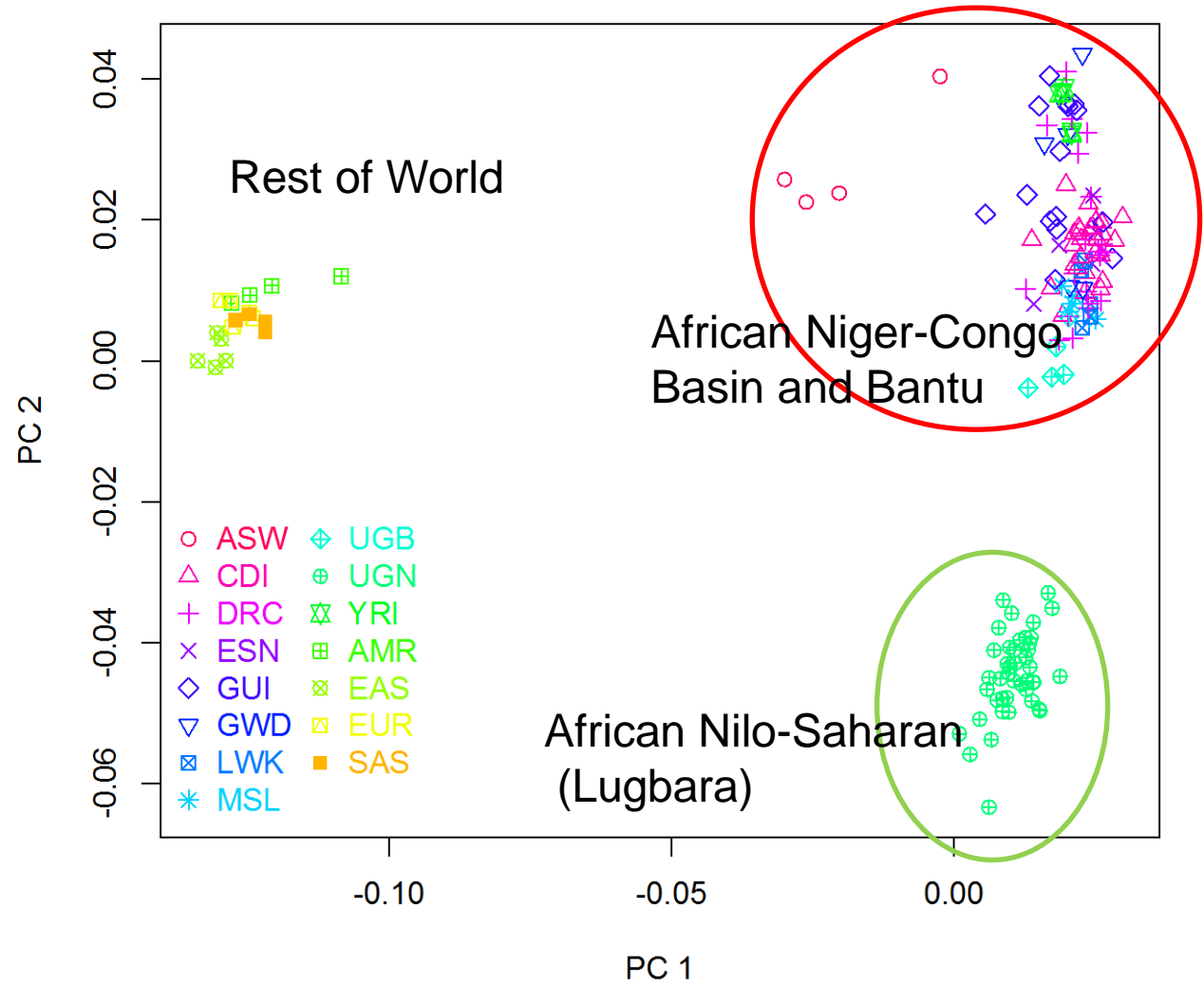




TrypanoGEN and 1000 genomes SNPs

Enock Matovu - Makarare

PC 1 v 2 of SNP on Chromosome 1



TrypanoGEN samples:

- CDI Côte d'Ivoire
- DRC Dem. Rep. Congo
- GUI Guinea
- UGB SE Uganda
- UGN N Uganda

- ❖ TrypanoGEN Bantu samples cluster tightly with 1000 genomes African (quality ✓)
- ❖ The Nilo-Saharan (Central Sudanic; Lugbara) cluster very distinct from other African samples



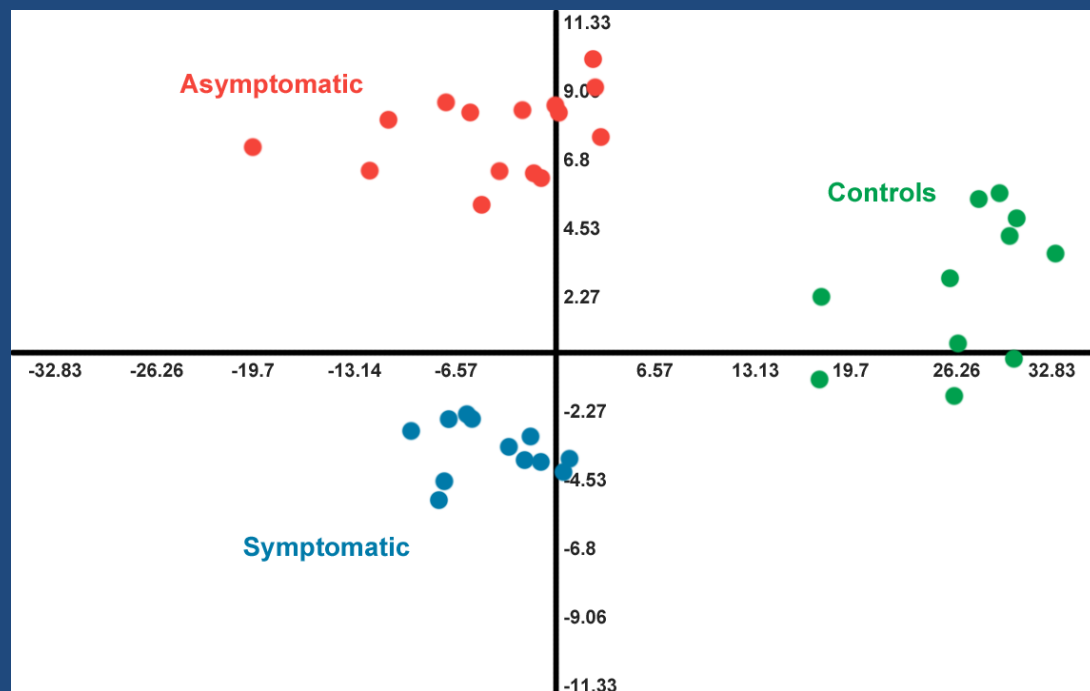
Pilot 2: Transcriptome analyses in Guinea

15 samples per phenotype

Asymptomatic carriers of *T. b. gambiense* have distinct cytokine and transcription profiles
(increase in IL-4, decrease in IFN γ .)

QTL: mostly genes of unknown function,
3 SNPs in HLA-A – class 1 MHC

71% prevalence in asymptomatics compared to 29 % in symptomatics, 23% in controls.



Christian Happi-Nigeria Advanced Genomics Training – Summer 2015



- MiSeq installation and operation
- Sample preparation and sequencing
- Sequencing analysis
- Independent research



USAID illumina
FROM THE AMERICAN PEOPLE

H3Africa: Projected Resources

➤ Infrastructure

- Pan-African Bioinformatics capacity (physical and human resources)
- Three DNA Biorepositories (East, West, and South)
- Ethical guidelines; best practices for informed consent and community engagement in an African context
- A collaborative community and a culture of data and sample sharing

➤ 70,000 DNA Samples to be collected with:

- A subset of harmonized phenotypes
- Broad representation of different ethno-linguistic, environmental, cultural and genetic backgrounds and different disease states
- ~55,000 samples with H3Africa genotyping array data

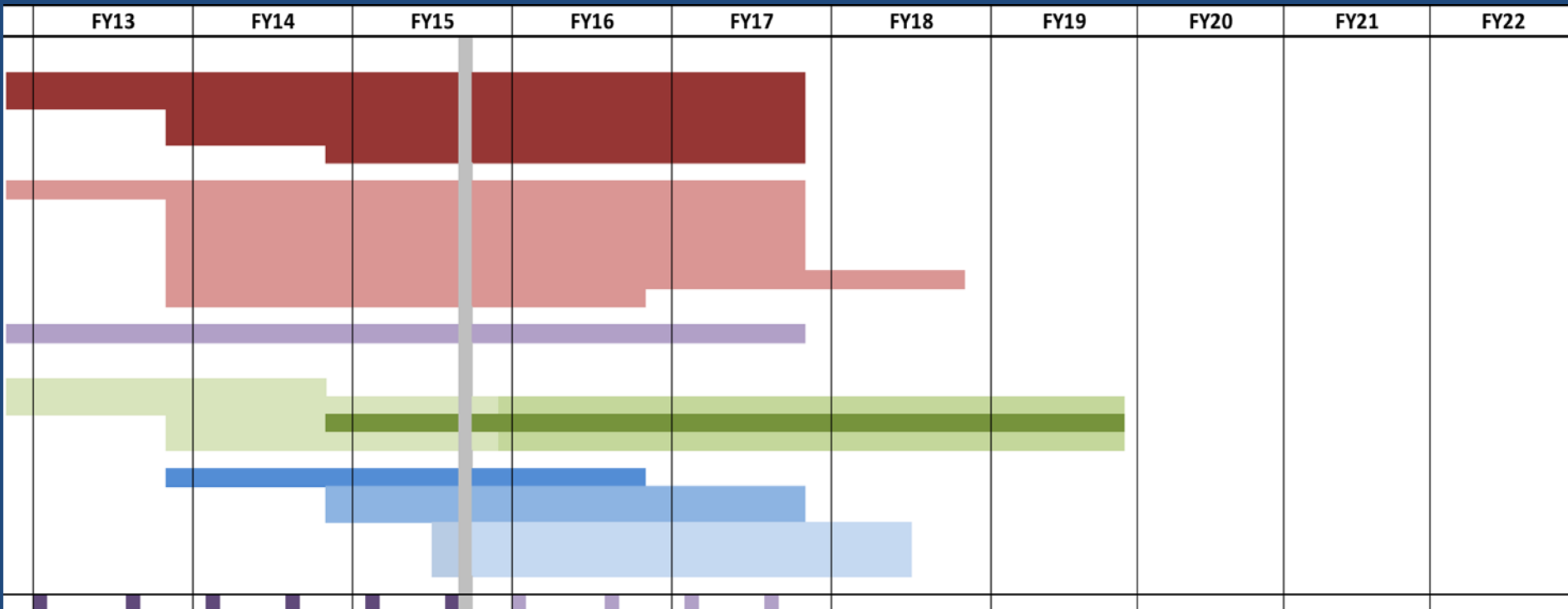
➤ Genomic data (genotyping, whole genome, exome, microbiome)

➤ H3Africa Pan-African genotyping array

➤ Guidelines, policies, and SOPs for African genomics research

H3Africa: Looking Forward

★ You are here ↓



STAGE I:
Capacity Building

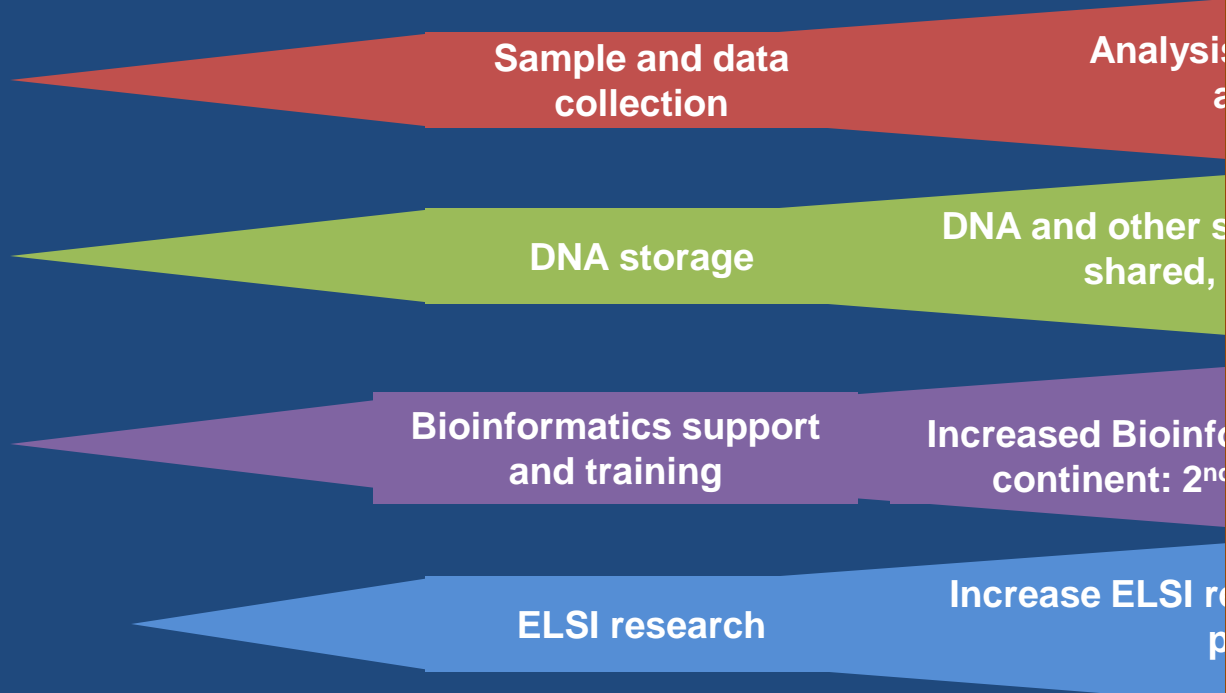
STAGE II:
Capacity Implementation

H3Africa: Looking Forward

★ You are here ↓



FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22
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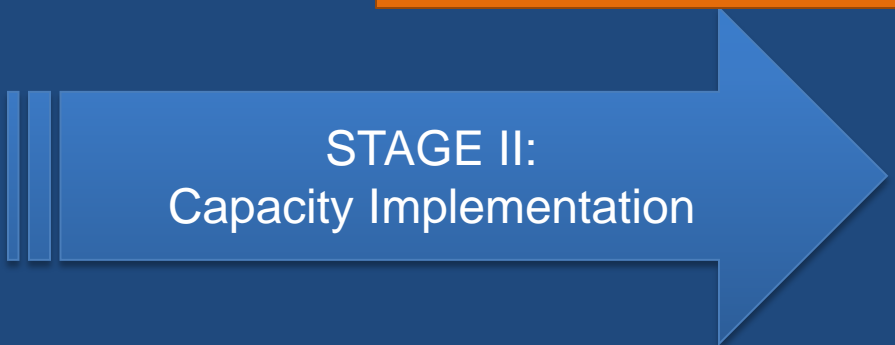
Analysis

DNA and other s
shared,

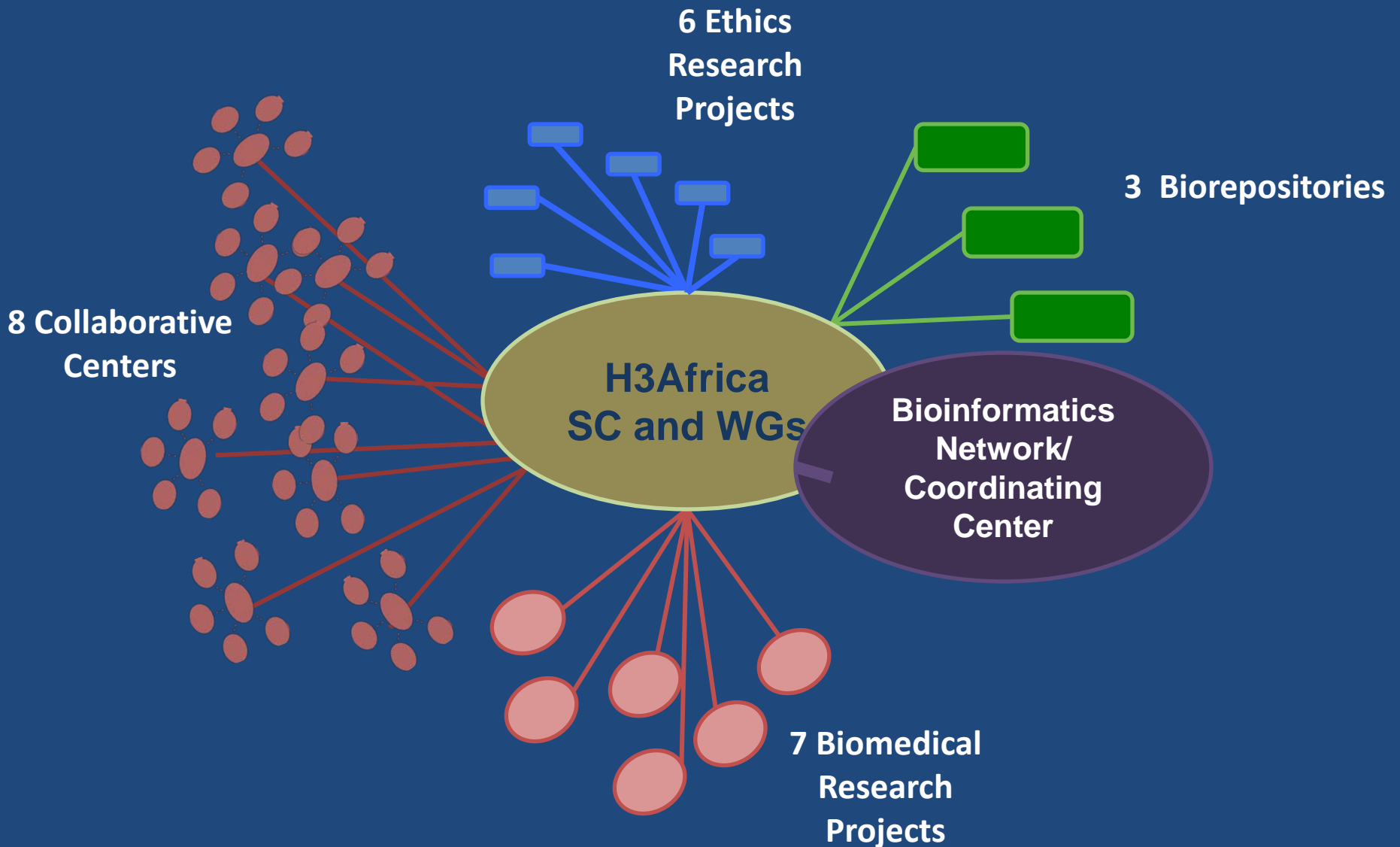
Increased Bioinf
continent: 2nd

Increase ELSI r
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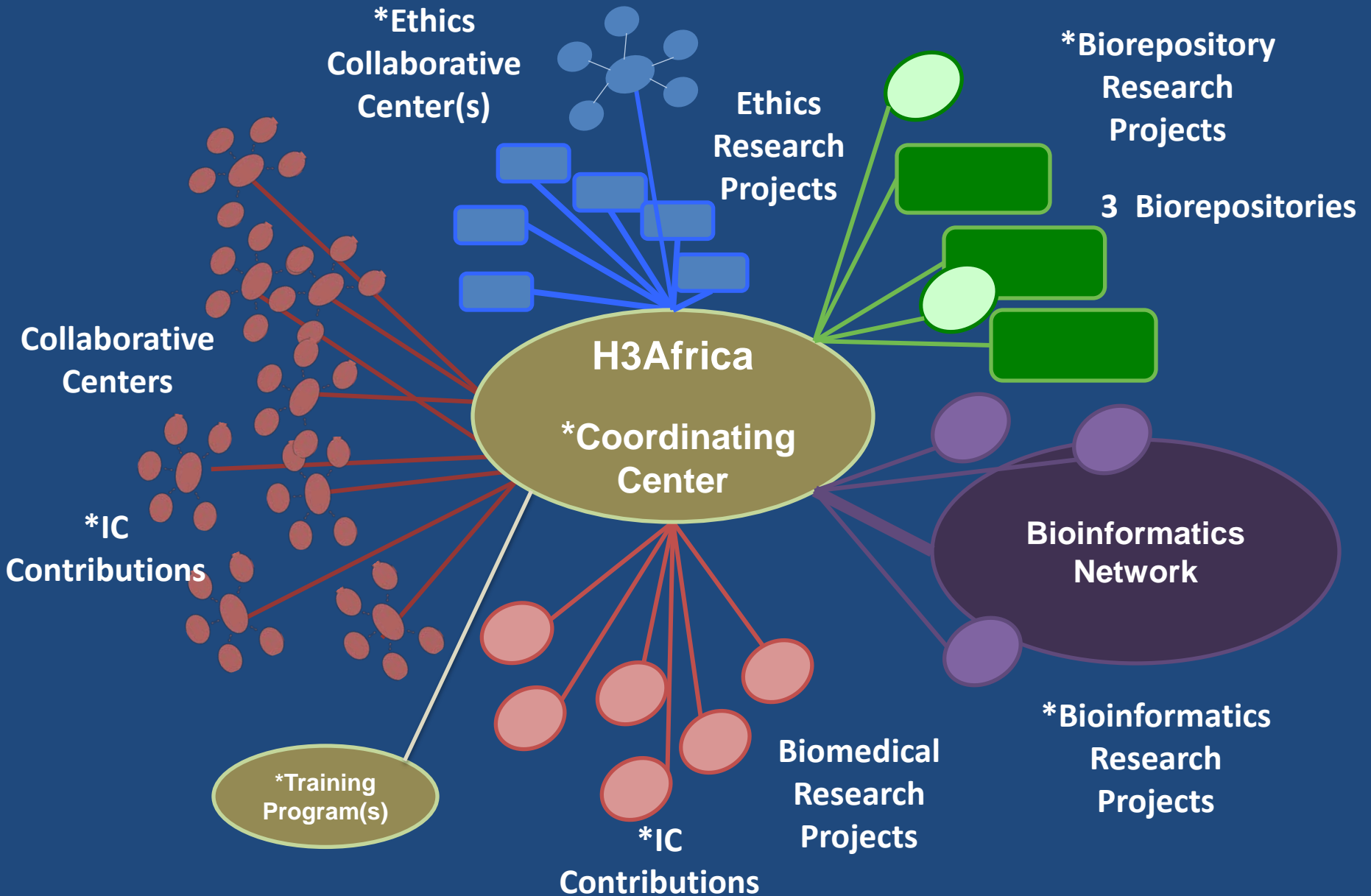
**Support
for
projects
of IC
interest**



The H3Africa Consortium: Stage I

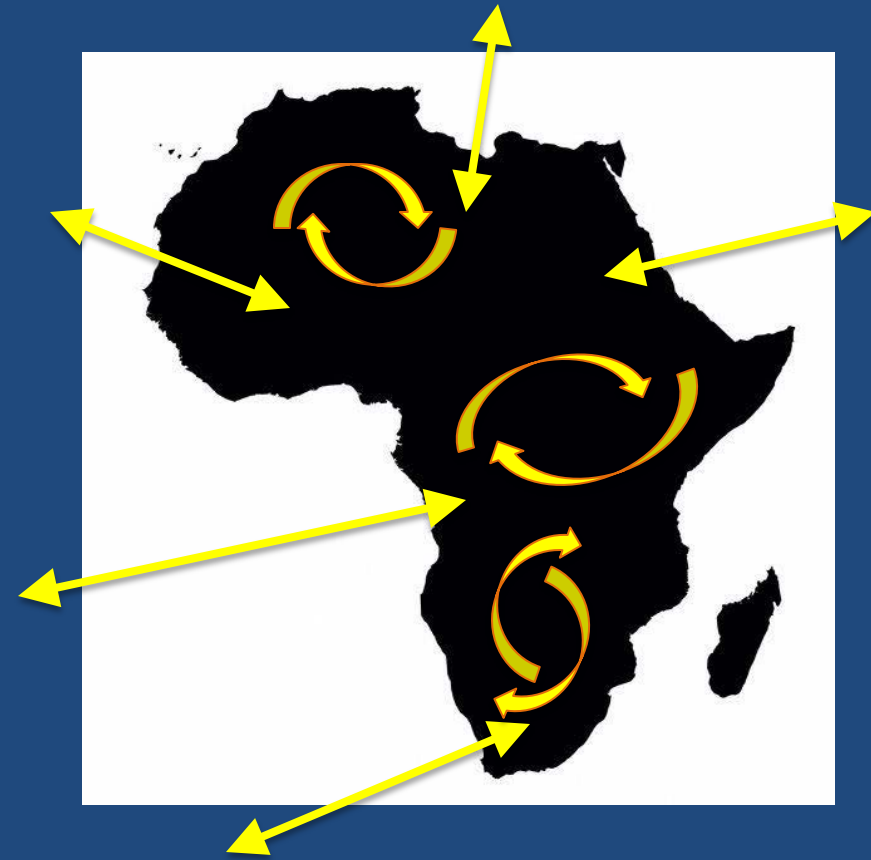


The H3Africa Consortium: Stage II



H3Africa: Synergy and Sustainability

- **NIH**
 - MEPI
 - BRAD
 - FIC training programs
 - IC Global Health Initiatives
- **Other Funding Agencies**
 - Wellcome Trust
 - GSK
 - Gates Foundation
 - Government Funding Agencies
 - SIDA
- **African Organizations**
 - AESA
 - AAS
 - AU
 - NEPAD



Challenges

=>

Opportunities

H3Africa NIH Working Group (EC)

*NHGRI:

Eric Green-chair
Joy Boyer
Cheryl Chick
Deborah Colantuoni
Chris Darby
Mark Guyer
Ebony Madden
Jean McEwen
Laura Skow
Sue Penno
Diane Patterson
Jeff Schloss
Jeff Struewing
Jennifer Troyer
Kris Wetterstrand
Ken Wiley

*OD:

Marie Nierras
Erica Spotts

*OAR:

Stacy Carrington-Lawrence

* = funding ICs

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Gray Handley
Robin Mason
Megan Hoffman
Trish Strickler-Dinglasan
Sudha Srinivasan
Karen Lacouriere

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Marva Moxey-Mims
Paul Kimmel

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Robert Finkelstein
Salina Waddy

NEI:

Louise Wideroff
Belinda Seto

*NICHD:

Regina James

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Joe Harford
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Vikram Bhadrasain
Makeda Williams
Jack Welch

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Norma Lerner
Keith Hoots
Emmanuel Peprah
Uchechukwu Sampson
George Papanicolaou

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NIDCR:

Emily Harris

NIMHD:

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Roger Little
Geetha Senthil

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Winifred Rossi
Jonathan King
Georgeanne Patmios

*FIC:

Ken Bridbord
Stacy Wallick

NIDA:

Steve Gust
Joni Rutter

NIAAA:

Peggy Murray

NLM:

Julia Royall
Dan Gerendasy