**Health and Human Services (HHS)**

**Approved SBIR/STTR Topics for Awards over Statutory Budget Limitations**

**Approved 5/26/2023**

HHS has received approval from the Small Business Administration (SBA)for the topics listed below for budget that exceed the SBA budget guidelines. Applicants are strongly encouraged to contact NIH program officials prior to submitting any award budget in excess of these amounts. For budgetary, administrative, or programmatic reasons, NIH and CDC may not fund an application or may decrease the length of an award and/or the budget recommended by a review committee. Applicants are also required to follow NIH Institute- and Center specific budget guidance found in all SBIR and STTR funding opportunity announcements

**National Institute on Aging (NIA)**

A.  Discovery, development, evaluation, or validation of social, behavioral, environmental, technical, and/or pharmacological interventions to prevent, treat, or slow the progression of age-related diseases and conditions, including Alzheimer's disease and AD-related dementias.

B.  Development of science-driven technologies, devices, and tools (including minimally perturbing sensing and monitoring technologies, assistive devices, robotics, and digital and mobile health products) at the individual, family, community, or institutional (including workplace) level to promote healthy aging, reduce health-related risks, support aging-in-place, improve care coordination and management, reduce the burden of caregiving, and/or to monitor, evaluate, analyze, treat, or prevent age-related decline and dysfunction.

C.  Development of research and analysis tools, methods, and screening platforms, and non-invasive approaches for the sampling and collection of data and to examine, monitor, and analyze human body systems and functioning in older adults, including the studying of molecular mechanism of normal aging and age-related diseases and conditions.

D.  Development and validation of innovative diagnostic tests and novel biomarkers to identify or predict age-related decline, dysfunction, diseases, and conditions, including Alzheimer's disease and AD-related dementias.

E.  Novel approaches to enhance diversity in recruitment for clinical trials and to address aging-relevant health disparities.

**National Institute on Alcohol Abuse and Alcoholism (NIAAA)**

A. Development of drug candidates for treating AUD and health-related effects of alcohol misuse and for diagnosing and evaluating conditions related to alcohol misuse

B. Development, optimization, validation, and testing of novel technologies, devices, methods or applications

    a. for neuroscience research (e.g., the effects of alcohol on central nervous system structure and activities)

    b. to support screening, brief intervention, referral to treatment, and recovery

    c. to prevent harmful drinking during pregnancy

    d. to identify prenatal alcohol exposure, and enhance outcomes of individuals with Fetal Alcohol Spectrum Disorder

    e. for preventing or treating alcohol-induced tissue injury

    f. for measuring alcohol consumption

    g. for the treatment of AUD

    h. for the prevention of death or serious injury due to extreme alcohol exposure/poisoning

C. Development and validation of tools, models, and technologies

    a. for alcohol-related laboratory studies, such as animal strains, cell lines, stem cells, in vitro techniques, neuroimaging, ligands, in vivo detection of neuromodulators, or computational tools

    b. for conducting and supporting research in alcohol field (e.g., mobile application and assessment development, electronic data management system, ecological momentary assessment)

D. Development of biomolecular signatures of alcohol exposure and alcohol-induced tissue injury

E. Digital health therapeutics and devices regulated by the Food and Drug Administration to treat or diagnose AUD or alcohol misuse

F. Genotyping of DNA samples from subjects with addiction and substance use disorders

**National Institute of Allergy and Infectious Diseases (NIAID)**

**Division of AIDS (DAIDS)**

A. Development of anti-HIV agents directed at new viral or cellular targets, including development and *in vivo* evaluation of sustained release formulations for treatment and prevention of HIV infection.

B. Development of novel therapeutics, including biological products and protein chemistry-based agents that eliminate HIV-infected cells.

C. Development and evaluation of therapeutic vaccines and other immune-based therapies to attenuate HIV disease progression or reduce HIV infectiousness.

D. Development of therapeutic strategies for curing HIV infection or effecting a sustained remission in the absence of daily antiretroviral drug therapy.

E. Development of methods for detecting and quantifying persistent reservoirs of replication-competent latent HIV in blood and tissues, including bio-imaging.

F. Development and evaluation of practical and affordable tests (e.g., viral load, drug toxicities, drug resistance) to monitor populations infected with HIV and associated infectious agents. Development of tests to detect early infection or viral rebound in HIV-infected individuals and to determine HIV incidence (HIV infection before seroconversion).

G. Development of long-acting (minimum 30 days) sustained/extended release pre-exposure prophylaxis (PrEP), post-exposure prophylaxis (PEP), and multipurpose prevention technologies (MPT) products that can provide systemic protection from HIV infection.

H. Development of rapid tests for the detection of antiretroviral drugs in various human matrices (e.g., blood, urine, hair).

I. Support novel technologies for HIV incidence detection; biomarkers of infection and prevention engagement; social media approaches to increase HIV prevention initiation/promote adherence; mathematical modeling of prevention strategies; and approaches to identify and retain key populations for HIV prevention research.

J. Development of processes suitable for HIV-1 vaccine product design, development and cGMP manufacturing, formulation, analytics and characterization of (a) HIV Env immunogens and related constructs/products; (b) fabrication, and development of nanoparticle-based delivery modalities, such as self-assembling proteins, surface conjugated/adsorbed nanoparticles, synthetic, lipid and polymer-based nanoparticles; (c) antigen-adjuvant formulations and/or combination-adjuvant(s) and dosage forms (e.g., suspension, lyophilized and aerosolized) for co-delivery/co-administration, (d) production of functional anti-HIV monoclonal antibodies; (e) vectored antibody gene delivery, (f) VLPs and viral vectors, and (g) DNA and RNA vaccine platforms.

K. Improving cell line development process (transient, stable pools, stable clones, etc.) by using existing and novel cell lines, cultures, and supporting/customized technologies to expedite and

increase Env expression, production, quality, and yield, novel chromatography purification platforms for viral vectors and Env proteins for HIV vaccine manufacturing.

L. Development of formulation and dosage form technologies to prevent or treat HIV and HIV-associated co-infections.

## Division of Allergy, Immunology, and Transplantation (DAIT)

M. Allergy, Asthma and Airway Biology Branch will consider preclinical and clinical research for conditions of interest: asthma, food allergy, eosinophilic esophagitis and gastroenteritis in relation to food allergy, atopic dermatitis, urticaria, rhinitis, rhinosinusitis, drug allergy, and sepsis. This includes but is not limited to the development of methodologies to manage, and analyze clinical and epidemiologic research in the above conditions and the development of biomarkers as diagnostic markers, markers of disease severity, predictive markers for treatment effectiveness, particularly of immunologic interventions such as allergen immunotherapy for food and respiratory allergy; novel approaches for detecting infants at risk for developing asthma and other allergic diseases; immune targets for asthma and allergic disease interventions; development of immunotherapies to prevent or treat allergic diseases.

N. Basic Immunology Branch will consider preclinical and clinical research to study the origin, maturation, and interactions of immune cells, immune cell receptors, ligands, cytokine biology, molecular basis of activation, antigen recognition, immune tolerance, immune response regulation, hematopoiesis and stem cell biology, enhancement of vaccine effectiveness in neonates and adults, and basic immunology of vaccines and immunotherapeutics as medical countermeasures for biodefense. This research includes but is not limited to development of novel vaccine adjuvants; single cell assays to isolate and study antigen-specific lymphocytes; immunotherapeutic antibodies; biomarkers of host immune defense; single cell and other sample-sparing assays for study of human immunology. Development and validation of immunologic reagents for analysis of immunity in non-mammalian (e.g., Xenopus laevis, zebrafish, C. elegans) and under-represented mammalian (e.g., pig, ferret, cow, sheep, bat) models.

O. Autoimmunity and Mucosal Immunology Branch will consider preclinical and clinical research to develop and improve therapies for the treatment of autoimmune diseases and primary immune deficiencies (not HIV), basic research of autoimmune disease mechanisms, and biomarkers, immunotherapy of disease processes, disorders mediated by lymphocyte products, and mucosal immunity. This includes but is not limited to innovative treatments for autoimmune diseases; standardized validated diagnostic criteria and outcome measures for autoimmune diseases correlated with disease activity; high throughput assay of T-cell activity in autoimmune diseases; biomarkers to measure risk, disease activity, and therapeutic response in autoimmune diseases; innovative treatments for autoimmune diseases; mucosal immunity.

P. Transplantation Branch will consider preclinical and clinical research in organ, vascularized composite tissue and cellular transplantation: acute and chronic graft rejection, allogeneic and xenogeneic transplantation, development of immunomodulatory agents to prevent and treat graft rejection and to promote acute and long term graft acceptance and immunologic tolerance, genomics of the alloimmune response, graft versus host disease for hematopoietic stem cell transplantation, minor histocompatibility antigens, complications of immunosuppression in transplantation, and major histocompatibility complex (MHC) region genomics and technologies for MHC typing. This includes but is not limited to methods and analysis tools to facilitate high throughput, high-resolution MHC typing in humans and non- human primates.

Q. Radiation and Nuclear Countermeasures Program will consider preclinical research to support radiation product development activities leading to the creation of IND or IUO packages to be submitted to the FDA. These products (assessed or administered at 24 hours or later after an

incident) are to diagnose, mitigate or treat the acute and/or delayed effects of injuries resulting from a radiation public health emergency. These IND/IUO-enabling actions could include: in vivo and or ex vivo studies to confirm efficacy, optimize formulation, dose, or dose schedule of a radiation medical countermeasure (MCM); drug product stability studies, drug product GMP manufacturing scale-up, GLP toxicology and pharmacology safety studies, pharmacokinetic and metabolism studies, chip technologies to determine human tissue-specific efficacy of a lead drug candidate, mechanism of action studies, and further identification and development of biomarkers of exposure and biodosimetry assay/devices that determine radiation dose and/or the biological impact of radiation exposure. Product development efforts will advance MCMs (e.g., products to mitigate injury or remove internalized radionuclides) or biodosimetric biomarkers and devices towards Phase I clinical safety studies, GLP animal pivotal efficacy studies, and/or licensure/approval/clearance by the FDA. Studies of greatest interest are focused on the severe effects of radiation and involve development of approaches targeting organ systems/microbiome/biomarkers for which no current diagnostics or treatments have been cleared or approved, such as gastrointestinal, lung, vascular, renal, cardiac, skin and central nervous system.

**Division of Microbiology and Infectious Diseases (DMID)**

R.  Identify and qualify infectious disease-related biomarkers, including:
   a) Biomarkers to predict susceptibility to infection and/or diagnose an infectious disease.
   b) Biomarkers to predict or monitor a subject's response to therapeutics or vaccinations.
   c) Biomarkers from natural history studies that could be used to assess disease progression in acute and chronic diseases.

S.  Development of rapid, highly sensitive and specific clinical diagnostics, including point-of-care diagnostics, that are easy to use, cost-effective and can diagnose individuals infected with pathogens or individuals that have been exposed to toxins.

T.  Discovery and development of vaccines or other immunoprophylaxis tools for infectious diseases.

U.  Development of vaccine enhancement and formulation technologies with the goal of providing protection against infectious disease agents, providing accelerated immune responses (more rapid schedules or reduced number of immunizations), increasing ease of administration (i.e., self-administration), increasing product stability to minimize cold chain requirements, and enhancing cost-effectiveness of vaccine manufacturing.

V.  Discovery, development, and clinical evaluation of therapeutics, including immunotherapeutics or other biologicals, to prevent infection, transmission, and for treatment of infectious diseases.

W. Development of technologies or approaches that address arthropod vector monitoring, management, and control to prevent transmission of vector-borne pathogens to humans.

**Office of Biodefense Research and Surety (OBRS)**

X. Chemical Countermeasures Research Program (OBRS/BRCB/CCRP) will only consider preclinical research supporting the discovery and early development of medical countermeasures (MCMs) that addresses the acute and/or long-term chronic toxic health effects after exposure to DHS-identified Chemicals of Concern.

**National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS)**

A. Late-Stage Translation of Biomedical and Behavioral Research Results in Arthritis and Musculoskeletal and Skin Diseases from Academic/Non-profit Lab to Marketplace

B. Research and development of new therapies using small molecules or biologics for arthritis, musculoskeletal and skin diseases.

C. Research and development of novel biomedical devices or tissue engineered products for arthritis, musculoskeletal and skin diseases.

D. Research and development of new biomarkers or novel imaging technologies for arthritis, musculoskeletal and skin diseases.

E. Research and development of innovative internet-based technologies to manage arthritis, musculoskeletal and skin diseases.

**National Institute of Biomedical Imaging and Bioengineering (NIBIB)**

A. **Artificial Intelligence, Machine Learning, and Deep Learning.** Design and development of intelligent and innovative algorithms, software, methods, and computational tools to enhance analysis of complex medical images and data. Relevant technologies include those that facilitate organization, representation, retrieval, analysis, recognition, and classification of biomedical and biological data and images. Unsupervised and semi-supervised techniques and methodologies are of particular interest.

B. **Image Processing, Visual Perception, and Display.** Design and development of algorithms for post-acquisition image processing and analysis. These algorithms include methods for image segmentation, image registration, atlas generation, morphometry measurement, and the determination of function and structure from medical images. Also supported by this program is the development of theoretical models and analysis tools to evaluate and improve the perception of medical images. This may include diagnostic-performance evaluation, assessment of computer-aided diagnosis technologies, statistical models for evaluation of observer performance, and assessment of observer variability. Finally, this program supports the development of visualization tools for improved detection.

C. **Biomedical Informatics.** Development of structures and algorithms to improve the collection, annotation, aggregation, anonymization, classification, retrieval, integration, analysis, and dissemination of quantitative and qualitative biomedical data. Examples of informatics tools and resources supported by this program are biostatistics methods for bioinformatics, meta databases and integrative services, digital biomarkers, information-driven computer-aided diagnosis and decision support systems, digital atlases, data mining, large scale biomedical image/information databases, data fusion, and hyperspectral data analysis and -omics. This program is intended to support NIBIB's other program areas in biomedical imaging and bioengineering researchers.

D. **Point of Care Technologies-Diagnostics.** Development of rapid in-vitro diagnostic technologies and monitoring platforms that provide real time medical evaluation and analysis of the disease status or condition at the time and place of patient care. Technology development area examples within the program include but are not limited to disposable lateral flow assays, nucleic acid testing platforms, glucose monitoring devices, etc. The program includes the delivery of healthcare that is safe, effective, timely, patient centered, efficient, and available in centralized and decentralized locations.

E. **Connected Health-Mobile Health and Telehealth.** Development of enabling technologies that emphasize the integration of wireless technologies with human and biological interfaces. This program includes the development of software and hardware for telehealth and mobile health studies. This program includes the input and delivery of healthcare information digitally for the analysis or monitoring of health or disease status. The emphasis is on developing mobile health technologies driven by clinical needs and integrating these technologies in healthcare delivery, wellness, and daily living.

F.  **Bio-Electromagnetic Technologies.** Development of technologies that use static or dynamic electromagnetic fields for sensing, imaging, or therapeutic effects. The emphasis is on increasing the sensitivity, spatial/temporal resolution, efficacy, or safety of bioelectromagnetic devices through the development of novel hardware, method of operation, or pre-/post-processing techniques for single modalities or the combination of multiple modalities. This program may support the development of magnetic particle imaging, electrical impedance tomography, electroencephalography, magnetoencephalography, electromagnetic-field-induced hyperthermia/ablation, and microwave/terahertz imaging, for example.

G.  **Magnetic Resonance Imaging.** Development of in vivo MR imaging and MR spectroscopy, for both animal and human research and potential clinical applications. The emphasis is on the development of MRI hardware and methodologies, including image acquisition and reconstruction techniques, that would improve the speed, spatial resolution, information content, efficiency, robustness, quality, patient experience, and safety. The emphasis should be on technological development rather than detailed applications to specific diseases or organs.

H.  **Optical Imaging and Spectroscopy.** Development and application of optical imaging, microscopy, and spectroscopy techniques for improving disease prevention, diagnosis, and treatment in the medical office, at the bedside, or in the operating room. Examples of research areas include fluorescence imaging, bioluminescence imaging, OCT, SHG, IR imaging, diffuse optical tomography, optical microscopy and spectroscopy, confocal microscopy, and multiphoton microscopy. The emphasis is on development of cost effective, portable, safe, and non-invasive or minimally invasive devices, systems, and technologies.

I.  **Bioanalytical Sensors.** Engineering the components and functionality of bioanalytical sensors. Detection could be based on optical, chemical, electrochemical, and/or physical (such as mechanical, gravimetric, thermal) perturbation of a sample, for example. Examples of technologies of interest include, but are not limited to, nano-textured substrates for analyte detection, DNA sensors for liquid biopsy, and small molecule detectors for diagnosing infectious diseases.

J.  **Molecular Probes and Imaging Agents.** Development and biomedical application of molecular probes and imaging agents across all imaging modalities for the visualization, characterization and quantification of normal biological and pathophysiological processes and anatomy in living organisms at the molecular, cellular and organ levels. The emphasis is on engineering of targeting and responsive molecular probes of high sensitivity and specificity for PET and SPECT (radiotracers), MR (T1, T2, CEST, hyperpolarized agents), EPR, CT, optical (fluorescent and bioluminescent probes), ultrasound (microbubbles) and photoacoustic imaging.

K.  **Ultrasound.** Diagnostic and Interventional. Improvement of technologies for diagnostic, interventional and therapeutic uses of ultrasound. The diagnostic ultrasound program includes, but is not limited to the design, development and construction of transducers, transducer arrays, and transducer materials, innovative image acquisition and display methods, innovative signal processing methods and devices, and optoacoustic and thermoacoustic technology. It also includes the development of image-enhancement devices and methods, such as contrast

agents, image and data presentation and mapping methods, such as functional imaging and image fusion. The therapeutic ultrasound program includes, but is not limited to the design, development, and construction of transducers, transducer arrays, interventional technologies, adjunct enhancement of non-ultrasound therapy applications, high-intensity focused ultrasound (HIFU), or hyperthermia applications. It also includes non-invasive or minimally invasive interventional surgical or therapy tools, ultrasound contrast agents for therapy, targeted drug delivery, neuromodulation, and biopsy.

L. **Image-Guided Interventions.** Development of novel image-directed technologies for guidance, navigation, tissue differentiation, and disease identification for reaching specified targets during therapeutic procedures, which may range along the continuum from non-invasive to minimally invasive to open surgical interventions. These technologies may range from molecular to macroscopic scale levels. In addition, emphasis includes technologies that expand needed procedural access for individuals otherwise excluded by disease characteristics, co-morbidities, and other parameters.

M. **Nuclear Medicine.** Research and development of technologies that create images out of the gamma- ray or positron emissions from radioactive agents that are injected, inhaled, or ingested into the body. The emphasis is on simulation and development of new detectors, collimators, and readout methods that enhance the signal quality of detecting isotope emissions; designs of novel camera geometries; and correction methods that compensate for the radiation physics properties to improve the clinical reliability of the image. Of interest are improvements and corrections for interaction events in PET detectors and enhancement to time of flight (TOF) image generation methods (reconstructions algorithms); as well as new collimator and camera designs for SPECT.

N. **X-ray, Electron, and Ion Beam.** Simulation, design and development of new detector systems; new readout methods that enhance the signal quality for x-ray image generation; designs of novel imaging geometries; algorithms that compensate for the physical properties of the detection system to improve the clinical reliability of the image (reconstruction algorithms); and approaches to radiation dose reduction, especially in CT. Of interest are diagnostic image enhancements via photon counting, dual energy, and new applications of cone-beam tomography.

O. **Bionic and Robotic Systems.** Development and demonstration of new approaches to control/program biology for biomedical intervention, without preference for any particular disease or application. Emphasis in this program is on engineering bionic and robotic systems to sense and actuate in response to human biology for biomedical intervention. Projects should be directed toward overcoming a technological challenge that limits biomedical adoption. This program encourages projects that use a design-build-test approach.

P. **Biomaterial Engineering.** Development and demonstration of new approaches to control/program biology for biomedical intervention, without preference for any particular disease or application. Emphasis in this program is on engineering new biochemical, biomechanical, bioelectric, biomagnetic, bioacoustics, or biophotonic materials, sensors,

actuators, and other parts and modules to interface and communicate with human biology and engineered systems for biomedical intervention. These parts and modules act as biotransducers to convert energy into biological action. Projects should be directed toward overcoming a technological challenge that limits biomedical adoption. This program encourages projects that use a design-build-test approach.

Q.  **Mathematical Modeling, Simulation and Analysis.** Development of novel mathematical modeling, simulation and analysis tools that can be broadly applied across a wide spectrum of diagnostic, therapeutic, imaging, and interventional applications. Emphasis is on engineering solutions for theory- driven, physics-based, physiologically realistic, virtual representations of biomedical systems, with a particular weight on multiscale modeling. Interests include, but are not limited to multiscale modeling, predictive modeling frameworks, non-standard methodologies, and methods to address model credibility, reproducibility, and reuse.

R.  **Synthetic Biological and Biomimetic Systems.** Development and demonstration of new approaches to control/program biology for biomedical intervention, without preference for any particular disease or application. Emphasis in this program is on engineering biological and biomimetic systems to sense and actuate in response to human biology for biomedical intervention. Projects should be directed toward overcoming a technological challenge that limits biomedical adoption. This program encourages projects that use a design-build-test approach.

**National Cancer Institute (NCI)**

A. Therapeutics (e.g., Small Molecules, Biologics, Radiomodulators, Gene/Cell-based Therapies and Drug Development-Related Tools, and Algorithm Development)

B. *In Vitro* and *In Vivo* Diagnostics (e.g., Companion Diagnostics, Prognostic Technologies, Treatment Monitoring and Diagnostic-Related Tools, and Algorithm Development)

C. Imaging Technologies (e.g., Agents, Devices, Software Tools, Algorithm Development, and Image-Guided Interventions)

D. Devices for Cancer Therapy (e.g., Interventional Devices, Drug Delivery Devices, Software Tools, Algorithm Development, Surgical, Radiation, and Ablative Therapies)

E. Agents for Cancer Prevention (e.g., Vaccines, but not "Technologies for Cancer Prevention")

F. Development of Low-Cost Technologies for Low-Resource Settings and Cancer Global Health

G. Development of Digital Health Tools

**Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD)**

**Child Development and Behavior Branch**

A.  Real time Human Interactive Data Acquisition and Analysis Technologies for Research and Telehealth Needs: Development and research testing of new or adaptation of existing devices and innovative technologies to improve virtual/remote data collection, to facilitate child and parenting intervention and/or healthcare (telehealth) delivery platforms with integrated collection, analysis, and automated coding, including audio and video recordings in real world settings (e.g., homes, childcare centers, schools, and primary care offices) over prolonged periods of time (i.e., days, weeks, or longer) to allow for (1) rapid analysis of interactions, including those involving one or more languages, and (2) simultaneous analysis of nonverbal and verbal behaviors during interactions. Incorporation of data from sensors capable of simultaneously recording real time physiological signals (e.g., pulse, heart rate, skin conductance response, temperature, accelerometer, etc.) time-locked to audio and video data and analyses is also highly desired.

**Contraception Research Branch**

B.  Development of innovative contraceptive approaches for both males and females.

**Developmental Biology and Congenital Anomalies Branch**

C.  Software development to facilitate the collection, mining, and analyses of genomic and phenotypic data from children affected with structural birth defects, and cross-analysis with model organism data

D.  Innovative technologies for validation and functional characterization of human structural birth defects-associated genetic variants in model systems

E.  Development of user-friendly software for biomedical researchers with limited knowledge of computational biology to analyze large-scale human genomic and other datasets associated with structural birth defects

F.  Creation of software platforms for assembly and display of predictive interactive computational models for complex gene regulatory networks coordinating embryogenesis

**Fertility and Infertility Branch**

G.  Development of novel techniques for assessment of gamete quality

H.  Development of Apps to monitor male and female reproductive health

I.  Over-the-Counter devices for in-home monitoring of ovarian follicle growth and ovulation

J.  Over-the-Counter devices for in-home monitoring of sperm quantity/quality/motility/ morphology, etc.

K.  Novel techniques for preservation of gametes and whole ovary and testes

L.  Development of techniques for use of non-embryonic stem cells for fertility preservation in cancer survivors

M.  Development of techniques for fertility preservation/restoration for

transgender/gender-nonconforming patients

N. Diagnostic tools and technologies based on discoveries in genomics, epigenomics, metabolomics and biomarkers for detection and treatment of infertility disorders

O. Development of small molecule therapeutics and cell/tissue therapies for treating infertility

**Gynecologic Health and Disease Branch**

P. Development of marketable novel or improved methods, devices, and technologies for the diagnosis, monitoring, and therapy of uterine fibroids, endometriosis, adenomyosis, benign ovarian cysts, abnormal uterine bleeding (including amenorrhea and heavy menstrual bleeding/menorrhagia), reproductive tract abnormalities (including congenital structural abnormalities and complications from female genital cutting), female pelvic floor disorders (including drugs and devices used for treatment of pelvic organ prolapse, urinary incontinence, fecal incontinence, and other female pelvic floor disorders), and gynecologic pain disorders (including chronic pelvic pain, vulvodynia, and dysmenorrhea).

**Intellectual and Developmental Disabilities Branch**

Q. Technology development to improve screening, diagnosis, treatment, and management of intellectual and developmental disabilities.

**Maternal and Pediatric Infectious Disease Branch**

R. New technologies relevant to resource-limited countries for screening, diagnosis, and management of infectious diseases in pregnant people, infants, children and adolescents, including but not limited to HIV such as SARS-Coronavirus-2, congenital CMV, congenital Syphilis, tuberculosis, viral hepatitis, other congenital infections such as cytomegalovirus, respiratory infections, etc.

S. Development and evaluation of vaccines relevant to HIV and other infectious diseases for infants, children, and pregnant/breastfeeding people.

**Obstetric and Pediatric Pharmacology and Therapeutics Branch**

Of note: NICHD considers applications for pediatric conditions that have significant efforts at other NIH institutes (e.g., sickle cell disease, pediatric oncology, juvenile diabetes) to be of lower programmatic priority.

T. Development of devices for delivery of therapeutics to patients or devices that can guide therapeutic decision making (e.g., dose determination, drug selection) for treatment of obstetric and lactation conditions or certain pediatric conditions.

U. Discovery and development of novel therapeutics to treat obstetric and lactation conditions or certain pediatric conditions.

V. Evaluation of new therapeutic uses/repurposing of pharmaceuticals (including but not limited to small molecules, biologics) and medical devices to treat obstetric and lactation conditions or certain pediatric conditions.

**Pediatric Growth and Nutrition Branch**

W. Isolation, purification, and synthesis of human milk components with biological activity.

X. Develop rapid and reliable methods to determine components (both nutritive and non-nutritive) in human milk.

Y. Development of tools and methods to accurately assess and measure growth and bone accrual.

Z. Technological innovations that lead to improvements in screening for nutritional disorders.

AA. Novel methods to assess disorders of weight gain, linear growth, and pubertal maturation.

## Pediatric Trauma and Critical Illness Branch

BB. The development of devices, innovative therapeutic technologies, and behavioral interventions to improve pediatric patient outcomes and minimize the negative sequelae of trauma, injury or critical illness.

## Population Dynamics Branch

CC. Developing tools and methods to accurately and reliably measure head circumference in infants and children

DD. Technological innovations or inventions to improve collection of biomarker and anthropometric data in large population-representative surveys

EE. Hardware or software to improve collection of accurate cause of death information in large population-representative surveys or in administrative data sets

FF. Innovative methods to add new reproductive and gynecologic questions and/or sampling frameworks to existing large cohorts and/or longitudinal studies

GG. Methods for improving the collection, documentation, archiving, linking, and dissemination of population representative data sets, especially data sets that are complex, multilevel, or

multimodal

## Pregnancy and Perinatology Branch

HH. Devices, instruments, and tools to minimize health-care-associated infection risks.

II. Methods to reduce pain in all of perinatal care (in newborn infants, in mothers in labor, during the postpartum period and after spontaneous delivery and cesarean section.

JJ. Novel methods to predict, assess, monitor, or treat (when feasible) fetal health, fetal growth, preterm birth, and preeclampsia.

## National Center for Medical Rehabilitation Research

KK. Development of medical rehabilitation interventions and biomedical technologies to improve rehabilitation treatment for restoration of function.

**National Institute on Drug Abuse (NIDA)**

**Topic List:**

A. **Area 1. SUD Drug Discovery and Development**

- Early discovery activities ranging from target identification and validation through lead development

- Assay development and validation

- Preclinical and/or clinical drug development
- New drug discovery and development-enabling technologies and tools, including Drug Development Tools (DDT), as defined by the FDA

B. **Area 2. FDA-regulated Medical Devices for SUD**
- Preclinical and/or clinical medical device development, including Medical Device Development Tools (MDDT), as defined by the FDA
- Medical devices, including Software as Medical Device (SaMD), intended for the monitoring and diagnosis of SUD
- Medical devices, including SaMD, intended for the cure, mitigation, treatment, or prevention of SUD

**National Institute on Deafness and Other Communication Disorders (NIDCD)**

A. Research and development for biomedical technologies (medical devices, diagnostic instruments, pharmaceuticals, drugs, therapeutics, vaccines, and biologics) that require clearance by the FDA as a regulated product before commercial distribution.

B. Development of novel open design hardware and software that facilitate rapid dissemination, reconfiguration, and enhancement to enable research beyond what can be performed with existing tools.

C. Projects proposing clinical trials with a large number of participants.

**National Institute of Dental and Craniofacial Research (NIDCR)**

**Infectious Diseases and Immunity**

A. Develop oral topical formulations with combined microbicidal, analgesic, and anti-inflammatory activities to enhance oral mucosal defenses and prevent and/or control oral infections and lesions in HIV-infected and/or immunosuppressed subjects.

B. Develop safe and effective targeted diagnostic and therapeutic technologies in response to endemic and pandemic infections

**Preclinical Research**

C. Preclinical research and development activities for dental and craniofacial technologies including the translation of innovative devices, drugs, biologic and combination products (reconstructive materials, regenerative products, pharmaceuticals, therapeutics, vaccines, digital health technologies) that require review and approval by the FDA as a regulated product before commercial distribution.

**Clinical Research**

D. Develop improved methods to detect and predict onset, progression and recurrence of dental, oral and craniofacial soft and hard tissue lesions.

E. Develop new or improve methods or materials to enhance oral and craniofacial surgery. This would include both intraoral and extraoral surgery.

F. Develop improved methods or materials to mechanically and/or biologically repair or treat dental oral craniofacial structures' damaged due to disease or other means..

G. Develop, customize, and validate data-driven technologies coupled with automated high throughput tools that accelerate development and regulatory evaluation of novel biomaterials.

H. Develop safe and efficacious methods to diagnose health status of dental, oral, craniofacial tissues and biofluids of the oral cavity'.

I. Develop technologies for local delivery of drugs to treat oral and craniofacial diseases or disorders.

J. Develop novel non-opioid pharmacological medications for management of orofacial pain.

K. Develop safe and efficacious methods or medications to manage complications of head and neck cancer treatment.

**Oral, Oropharyngeal and Salivary Gland Cancers**

L. Develop imaging techniques for the early detection, diagnosis and prognosis of pre-malignant lesions.

M. Develop genetic animal models of oral cancer premalignancy and oral cancer progression that mimic human oral cancers, including HPV associated oropharyngeal cancers.

**Temporomandibular Disorder and Orofacial Pain**

    N. Identify and develop novel pharmacologic or biologic agents, including but not limited to small molecules, peptides, recombinant proteins and nucleic acids intended to prevent, control, and/or treat orofacial pain**.**

    O. Preclinical research and development activities for first in human Temporomandibular (TMD) therapies that require review and approval by the FDA prior to clinical testing.

**Saliva, Salivary Diagnostics, and Salivary Gland Diseases**

    P. Develop viral, non-viral and gene therapy-based approaches to address compromised salivary gland function. Develop cell and tissue-based strategies and technologies for restoration of damaged or destroyed salivary gland function.

    Q. Develop novel compounds or materials that protect and preserve salivary glands from head and neck cancer irradiation therapy.

    R. Development of non-invasive methods for the determination of efficacy and safety of artificial saliva, sialogogues, and of their delivery vehicles used in addressing the diminution or lack of saliva (xerostomia) due to Sjögren's Syndrome or head and neck cancer irradiation therapy.

    S. Develop biomarker-based technologies for the identification of Sjögren's Syndrome using blood or saliva as body fluids.

**Biotechnology, Biomaterials, and Applications for Regeneration and Restoration of Oral, Dental and Craniofacial Tissues**

    T. Develop methods, materials, and devices for orthodontic, prosthodontic, prosthetic, periodontic, endodontic and craniofacial applications including those that can be used for craniofacial bone distraction, reconstruction, hard and soft craniofacial tissue healing and regeneration, and scarless craniofacial tissue repair.

    U. Develop imaging diagnostics to accelerate clinical implementation of reliable, reproducible, highly specific and sensitive diagnostic instruments for various applications, including but not limited to dental caries, cracked teeth, pulp vitality, oral lesions, bone quality, and periodontal disease.

    V. Develop safe and effective biosensors, monitoring devices and systems, data driven and computational tools for automated detection, diagnosis and treatment of dental, oral and craniofacial disease.

**Clinical and Behavioral Research**

    W. Develop and test for safety, efficacy, and/or effectiveness of measures or materials for diagnosing, preventing, or treating oral, dental, and craniofacial conditions and disorders.

**National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)**

**Topic List:**

A. Development or evaluation of pharmacological agents (i.e., drugs, therapeutics), gene therapies, novel formulations, cell-based or other biological technologies for intervention in or prevention of Diabetes and Digestive and Kidney Diseases.

B. Development or evaluation of biomedical devices, tools, techniques, or instrumentation for intervention in or prevention of Diabetes and Digestive and Kidney Diseases.

C. Development of biomarkers, assays, techniques, diagnostic technologies or associated reagents for assessing state or function in normal, developing, or diseased cells or tissues affected by Diabetes and Digestive and Kidney Diseases.

D. Development or evaluation of imaging, screening, or evaluation techniques or technologies for assessing state or function in normal, developing, or diseased cells or tissues affected by Diabetes and Digestive and Kidney Diseases.

E. Development or evaluation of animal or cell models for studying Diabetes and Digestive and Kidney Diseases.

F. Development or evaluation of novel materials or material treatments (e.g., sterilization, coating, etc.) for use in devices or other tools or methods used to prevent, diagnose, or treat Diabetes and Digestive and Kidney Diseases.

G. Development of cell- or data-banks for the biomedical research community.

H. Development or evaluation of technologies, including software applications, for improving patient adherence in Diabetes and Digestive and Kidney Diseases.

I. Development or evaluation of technologies for improving clinical research in Diabetes and Digestive and Kidney Diseases, including technologies for improving data collection and reporting of patient outcomes.

J. Development or evaluation of –omics, informatics, or internet-based technologies for biomedical research or clinical applications in diagnosing or managing Diabetes and Digestive and Kidney Diseases.

K. Development or evaluation of technologies to prevent or avert cell or tissue injury during other disease states or surgical procedures.

**National Institute of Environmental Health Sciences (NIEHS)**

A.  Tools and technologies for toxicity screening of compounds

B.  Devices and computational approaches for improved exposure assessment

C.  Assays, complex in vitro systems, and computational approaches for predictive toxicology

D.  Validation of sensor technologies, including field testing to improved performance characteristics and usability of the sensors

E.  Intervention technologies to prevent or reduce exposures to environmental stressors

F.  Tools and approaches for expanding environmental health literacy

**National Eye Institute (NEI)**

**General Research and Development Topics**

    A. New or improved ophthalmic or surgical instruments for diagnosis and treatment of eye disorders.

    B. Drug delivery systems; gene therapy, cell-based therapy or regenerative medicine.

**Retinal Diseases**

    C. New therapeutic approaches for inflammatory and degenerative diseases and for inhibition of abnormal angiogenesis in the retina and choroid.

**Corneal Diseases**

    D. New therapeutic approaches, artificial corneas, and drug delivery methods for the treatment of corneal injury, infection, dry eye, ocular pain, and other ocular surface disorders.

**Lens and Cataract**

    E. New approaches in the management of cataracts.

**Glaucoma and Optic Neuropathies**

    F. New therapeutic agents for treatment of glaucoma.

**Visual Impairment and Blindness**

    G. New or improved devices, systems, or programs that meet the rehabilitative and everyday living needs of blind or visually impaired persons.

**National Institute of General Medical Sciences (NIGMS)**

**Division of Biophysics, Biomedical Technology and Computational Biosciences (BBCB)**

A. Development of instrumentation and/or computational methods for detection, analysis, separation and/or manipulation of cells (e.g., flow cytometry).
B. Development of software for improving the effectiveness of computational approaches in analysis of biomedical data. Areas of interest include, but are not limited to, genomics, proteomics, metabolomics, and electronic health records.
C. Development of new methods and materials directed toward the determination of macromolecular structures, assemblies, and complexes using methods including, but not limited to, x-ray diffraction, electron diffraction, cryo-EM, NMR and mass spectrometry.
D. Development of computational tools and methods for modeling, simulations and/or analysis of complex biological systems.
E. Development of methodology (technology) for genetic manipulation and analysis and detection of genetic polymorphisms, including disease genes (e.g., gene expression, probes) and/or detection of epigenomic changes (e.g, CRISPR).
F. Technologies for application of microscopy, spectroscopy, optical imaging, and single molecule analysis in basic biomedical research. Modalities of interest include, but are not limited to, fluorescence, scanning probe, electron paramagnetic resonance (EPR) and infrared (IR).

**Division of Pharmacology, Physiology, and Biological Chemistry (PPBC)**

G. Development of technologies and methods to better achieve anesthesia and control of peri-operative pain.
H. Development of technologies to improve delivery of small molecules and biologics, not specific to an organ system or disorder (those projects should be directed to other categorical institutes of NIH).
I. Artificial intelligence and machine learning approaches to address early recognition of critical illness, including but not limited to sepsis, sepsis endotypes, patient trajectories, and resolution of sepsis.
J. Development of factors or therapies or devices involved in treating injuries not specifically linked to chronic illnesses, including tissue repair and wound healing.
K. Synthetic chemistry to efficiently produce methods for molecules of biomedical significance (including evaluation through pre-clinical testing).

**Division of Training, Workforce Development, and Diversity (TWD)**

L. Development of products or services to enhance diversity of the scientific workforce.

**Division for Research Capacity Building (DRCB)**

M. Development of efficient, user-friendly, and culturally appropriate resources to enhance health science literacy.
N. Development of educational products for fostering biomedical entrepreneurship in under-resourced states.

**National Heart, Lung, and Blood Institute (NHLBI)**

A. Biomedical technologies (medical devices, instruments, pharmaceuticals, drugs, gene editing/delivery, therapeutics, vaccines, molecular imaging agents, diagnostics and biologics) for heart, lung, blood, and sleep related diseases and disorders requiring Federal regulatory approval (FDA) or clearance to be commercialized.

B. Small and large animal testing of products of tissue engineering and regenerative medicine, drugs, medical devices, therapeutics, molecular imaging agents, and biologics and studies involving in vivo animal experiments for heart, lung, blood, and sleep-related diseases and disorders.

C. Clinical trials and other experiments involving human subjects for heart, lung, blood, and sleep-related diseases and disorders.

D. Therapeutics (drugs, devices, gene therapy, or other biologics) development for heart, lung, blood, and sleep-related diseases and disorders.

E. Device development for heart, lung, blood, and sleep-related diseases and disorders

F. Diagnostics development for heart, lung, blood, and sleep-related diseases and disorders.

G. Investigation of biomarkers and biosignatures of heart, lung, blood, and sleep-related diseases and disorders.

H. Technologies to enhance clinical research for heart, lung, blood, and sleep-related diseases and disorders.

I. Advanced instrumentation and high throughput tools for biomedical research in heart, lung, blood, and sleep-related diseases and disorders.

J. Tools and platforms to improve the dissemination and implementation of evidence-based interventions for heart, lung, blood, and sleep-related diseases and disorders.

**National Human Genome Research Institute (NHGRI)**

A. Significant innovations in genomic methods or technology development. This includes, but is not limited to, advancements in nucleic acid sequencing, synthetic nucleic acid synthesis, functional genomics, single cell genomic analysis, instrumentation, or molecular kits.

B. Tools and techniques that use genomics to improve patients' health, such as approaches to incorporate genomic results into electronic medical records, clinical decision support tools, or genomic directed health care.

C. Strategies to enhance ethical, legal, and social aspects of genomics research or translation of genomics into health care.

D. Bioinformatics software or platforms for genomic, genetic, or sequence data processing or analysis, functional genomics, associations between genomic data and diseases or phenotypes, interpretation of variants, or genomic data integration into clinical decision making.

E. Databases and data management platforms for genomics research and application including platforms for sequence, functional, or phenotypic data or annotation of variants.

F. Development and application of methods for machine learning, pattern detection, or knowledge networks for genomics science or translation into health care.

G. Informatics methods and platforms that adopt data standards, enhance data sharing with privacy, and improve data exchange in genomics science or translation of genomics into health care.

H. Use of cloud and other computing models to improve scale, reproducibility, interoperability, cost-effectiveness, and utility of genomic and clinical data in genomics or translation into health care.

I. Development of curriculum and educational opportunities that increase the genomics knowledge of participants at the undergraduate, postbaccalaureate, graduate, postdoctoral, or professional levels.

**National Institute of Mental Health (NIMH)**

**All Divisions:**

A.  Preclinical drug/device development studies, including pharmacology, efficacy, and toxicology.

B.  Completion of studies as required by the Food and Drug Administration (FDA) for Investigational New Drug (IND) or Radioactive Drug Research Committee (RDRC) application.

C.  Studies in normal healthy volunteers to determine a drug's safety profile, metabolism, etc.

D.  Clinical studies in patient/disease population to assess the drug's effectiveness.

E.  Assessment of devices with regard to performance standards related to the FDA approval process.

F.  Safety and effectiveness studies of novel medical devices.

G.  Evaluation of novel imaging approaches for diagnostic purposes.

H.  Clinical studies in support of Pre-Market Approval for biomarkers/medical devices by the FDA.

I.  Rapidly develop novel, engaging computer-based cognitive training programs that are based on efficacious neurotherapeutic approaches and which use cognitive training to target a specific neural system/functional domain.

J.  Develop and test new and augment existing digital health interventions that is personalized, engaging, adaptive, sufficiently challenging, and optimal for maximizing real world functional improvements.

K.  Test the feasibility, efficacy and potential adverse effects of these programs utilizing measures of functional outcomes in an identified clinical population, particularly those with neuropsychiatric disorders, ASD, and/or HAND, at a specified developmental stage, including measurement of the duration of treatment effects.

L.  Rapid development and evaluation of mobile based platforms and applications.

**Division of Neuroscience and Basic Behavioral Science (DNBBS)**

M.  Novel imaging probes to study brain structure and function at all levels, from the molecular to the whole organ, using any imaging modality (PET, fMRI, optical, etc.).

N.  Drug discovery/drug development of novel compounds which act on molecular pathways (receptors, enzymes, second messengers, etc.) that are not typically targeted with currently available psychiatric drugs, and that have a strong biological justification as a novel mechanism for treatment of psychiatric disorders.

O.  Novel screening assays for high throughput acquisition and analysis of data about behavior and the brain, from the level of genes to the level of behavior.

P. Novel technologies that would enable researchers to study how populations of neural cells work together within and between brain regions, in order to understand how changes in neural activity contributes to mental disorders.

Q. Complex instrumentation for neuroscience research

R. Complex brain or cellular imaging or analysis.

S. Tools to facilitate the detailed analysis of complex circuits and provide insights into cellular interactions that underlie brain function.

T. Proof-of-concept testing and development of new technologies and novel approaches for large scale recording and manipulation of neural activity, at or near cellular resolution, at multiple spatial and/or temporal scales, in any region and throughout the entire depth of the brain

U. Iterative refinement of such tools and technologies with the end-user community with an end-goal of scaling manufacture towards reliable, broad, sustainable dissemination and incorporation into regular neuroscience practice.

V. Novel informatics tools to facilitate the sharing of complex data sets between laboratories.

W. Novel tools for investigating brain-derived GPCRs in mental health research.

X. Educational tools/technologies for neuroscience and mental health.

Y. Technologies to support the goals of the BRAIN Initiative: http://www.braininitiative.nih.gov/

**Division of Translational Research (DTR)**

Z. Develop, test and validate reliable and stable biomarkers that can identify at-risk individuals prior to disease onset, improve diagnosis, predict treatment response, or measure disease progression. Biomarkers are also needed in clinical trials to identify dose ranges, to identify a specific subpopulation of subjects to enroll in a treatment trial, or to measure efficacy or toxicity/side effects.

AA. Develop novel and targeted interventions (pharmacological, cognitive, behavioral, computer, or device-based) that affect particular neural circuits and signaling pathways relevant to the developmental trajectory of the disease.

BB. Conduct early stage, proof of concept clinical trials to advance the development of novel therapeutics. The clinical trials are expected to include biological/behavioral data to assess target engagement and to help determine potential success or failure of the compound before moving on to larger clinical trials (see NOT-MH-11-015 http://grants.nih.gov/grants/guide/notice-files/NOT-MH-11-015.html).

CC. Based on expanded knowledge of neurobehavioral trajectories, develop novel objective assessment tools that can identify early signs of risk or onset of recurrence of particular mental disorders or in domains of functioning (see MH's RDoC project: http://www.nimh.nih.gov/research-funding/rdoc/index.shtml) for pediatric populations.

DD. Develop computational biological/behavioral assessment tools that can be used across ages, species, and cultures to evaluate dysfunction in domains relevant to mental disorders (e.g., mood dysregulation, deficits in executive function).

EE. Develop computational platforms to enable the integration and sharing of data characterizing typical and atypical developmental trajectories in humans and non-human animals.

FF. Clinical research tools.

GG. Develop valid measures of the various constructs in the Research Domain Criteria (RDoC) matrix (see http://www.nimh.nih.gov/research-funding/rdoc/index.shtml ), e.g., neurocognitive tasks, psychometrically sophisticated questionnaires, measures of behavior, and biomarkers, into a commercial product.

HH. Develop clinical risk assessment instruments that encompass multiple domains (e.g., genetic, neurobiological, and environmental), are sensitive to developmental stage, and have high predictive power for the onset or recurrence of mental illness.

II. Developing clinical risk assessment instruments for developing particular benefits or harms during treatment for mental disorders and communicating such probabilistic information to patients and their families in a readily understandable manner.

JJ. Develop electronic sensors, monitoring devices and systems, and data analysis software for automated detection and diagnosis of mental disorders and key transdiagnostic dimensions of psychopathology.

**Division of AIDS Research (DAR)**

KK. Develop and test novel, non-invasive diagnostic approaches (instrumentation, imaging, biomarkers, central nervous system [CNS] cell-based in vitro models) to assess neurocognitive dysfunction associated with HIV-1 infection and persistence of HIV-1 in the CNS.

LL. Design and test novel therapeutic strategies aimed at amelioration of HIV-1 associated CNS co-morbidities and/or eradication of HIV-1 from CNS reservoirs including strategies to prevent viral resurgence in the CNS upon cessation of anti-retroviral therapy.

MM. Develop innovative technologies for targeting therapies (such as anti-retroviral drugs) to the brain; adapt immunotherapy and gene modification agents for targeting CNS viral reservoirs and discover neuroprotective mediators with improved capability to cross the blood-brain barrier to ameliorate HIV-1 associated CNS co-morbidities.

NN. Develop evidence-based interventions to reduce risk for HIV among at-risk individuals or improve outcomes along the HIV care continuum for individuals living with HIV which are delivered through mobile devices or other technologies.

OO. Develop technologies, instruments and tools, including multipurpose prevention technologies, to: improve uptake, adherence, and persistence to biomedical HIV prevention and treatment regimens; increase regular HIV testing among those most at risk of acquiring HIV; and translate findings from basic behavioral and social science research into processes to improve engagement in HIV care.

PP. Develop new tools/ techniques to aid in deciphering the complex neuro-immune interactions at a molecular and cellular level in the context of HIV.

QQ. Build and optimize multimodal domain-based informatics/assessment tools to aid in analyzing and characterizing the phenotype of CNS co-morbidities associated with HIV by using machine learning, big data and systems biology-based approaches.

RR. Develop innovative long-acting systemic and non-systemic multipurpose prevention technologies that prevent HIV infection and pregnancy (hormonal and non-hormonal methods) in adolescents and young women.

SS. Develop and improve digital communication technologies to raise HIV awareness and promote accurate and timely healthinformation to users, groups, and geographic regions most impacted b y HIV.

TT. Develop innovative tools and approaches that use existing patient-level data, such as electronic medical records and prescription refill or claim data, to improve engagement in HIV care or HIV treatment adherence to strengthen sustained viral suppression, including development and testing of predictive algorithms to identify those at risk for future non-adherence.

UU. Develop approaches that seamlessly integrate tools for mental health screening and treatment into HIV healthcare or increase the capacity of HIV clinics to address mental health concerns.

VV. Develop decision support tools that help individuals, couples, and clinicians make informed choices about the increasing number of proven and available HIV prevention and treatment regimens, including long-acting regimens and multipurpose prevention technologies (MPTs).

WW. Develop innovative wireless technologies, remote sensing devices, biomarkers, assays, or other novel methods to improve scientific measurement of HIV exposure due to sexual behavior, or scientific measurement of social determinants that influence HIV treatment and prevention. Assessment approaches could occur retrospectively (not a clinical trial – using existing data, such as electronic medical records).

**Division of Services and Intervention Research (DSIR)**

XX. Randomized clinical trials evaluating the effectiveness of known efficacious interventions.

YY. Analyses of naturalistic databases to evaluate the effectiveness of known efficacious interventions.

ZZ. Identifying moderators and mediators of intervention effects as a step to design and test personalized interventions.

AAA. Evaluating the combined or sequential use of interventions.

BBB. Determining the optimal length of intervention, establishing the utility of continuation or maintenance treatment (that is, for prevention of relapse or recurrence).

CCC. Evaluating the long-term impact of efficacious interventions on symptoms, functioning, and quality of life.

DDD. Developing novel information technology tools designed to improve the delivery and dissemination of evidence-based interventions and assist healthcare providers in identifying, adopting, and implementing proven prevention and treatment interventions.

**Services research covers all mental health services research issues across the lifespan and disorders, including but not limited to:**

EEE. Services organization, delivery (process and receipt of care), and related health economics at the individual, clinical, program, community and systems levels in specialty mental health, general health, and other delivery settings (such as the workplace).

FFF. Interventions to improve the quality and outcomes of care.

GGG. Enhanced capacity for conducting services research.

HHH. The clinical epidemiology of mental disorders across all clinical and service settings.

III. The dissemination and implementation of evidence-based interventions into service settings.

**National Institute on Minority Health and Health Disparities (NIMHD)**

A. Telehealth, telemedicine, and mobile health technologies (e.g., smart phone apps, web-enabled wearable sensors, video medical conferencing and medication monitoring technologies) to improve remote access to prompt diagnosis, early treatment, adherence, and remote clinical management for adult and pediatric patients. Such technologies are expected to improve access to specialty care that would otherwise be inaccessible due to high cost or transportation barriers (e.g., by linking academic tertiary care-oriented health centers with community-based primary care settings, or for linking health care or community-based navigators to community dwelling individuals or families).

B. Products, technologies or services designed to improve accessibility or uptake of existing and emerging technologies (e.g., mobile phones, tablets, free WiFi, diabetic glucometers, blood pressure monitors, viral exposure and tracking technologies, etc.), to decrease mortality and morbidity, promote healthy lifestyles, family centered-management or self-management, enhance patient-clinician communication, provide patient medical education for self-or family-management of chronic diseases/conditions, or enhance surveillance and reduce the spread of communicable and non-communicable diseases in minority and health disparity populations.

C. Products, technologies or services that take advantage of existing or emerging technologies (e.g., electronic health record systems, biomedical informatics platforms, big data resources and analytics, precision medicine, precision health, precision nutrition, predictive analytics, etc.) to improve medical and health information dissemination and utilization by individuals, families, and community-based or community-located small business, such as barber shops, beauty salons, pharmacies, health services delivery and quality of care, including but not limited to coordination of primary and specialty care, integration of behavioral health services into primary care settings, and reduction of health literacy barriers in minority and health disparity populations.

D. Products, technologies or services including but not limited to the development of novel analytical tools and methods and interventions for the early detection of diseases, pre-disease states, or adverse health conditions resulting from traditional risk factors or from social and structural factors known to contribute to poor minority health and health inequities. Such technologies could include novel or validated biomarkers in saliva, breath, blood, and other tissues or specimens, including microbiota.

E. Groundbreaking products or technologies to monitor real-time or cumulative exposures to physiological, physical, social and environmental exposures and risk factors across multiple levels and domains of influence and periods across the life course. Such products may improve understanding of how biological, social and structural factors significantly contribute to population health disparities and empower individuals, families, and communities from health disparity populations to take steps to avoid or mitigate the effects of such exposures. Technologies may include, for example, personalized technologies for precision-based medicine, -omics, and nutrition, wearables, predictive analytics, robots and virtual reality, graphic information systems and related spatial analytic techniques, and eMental health interventions for delivery of psychosocial support services.

F.  Technologies for preventing and minimizing adverse exposures and health risks (e.g., violence, post-traumatic stress, historical trauma) or for promoting health, well-being, resilience, and recovery resulting from disasters or the threat of a disaster. Disasters are defined as presidentially declared emergencies or major disasters under the Stafford Act, a public health emergency declared by the Secretary of the HHS, or other local, regional or national disaster(s), and include but are not limited to extreme weather-related disasters (e.g., hurricanes, typhoons, tsunamis, floods, mudslides, tornadoes, volcano eruptions, earthquakes, dust and snowstorms, wildfires and others), human-made disasters (e.g., oil and chemical spills and contamination, nuclear testing and contamination, air, soil, and water contamination, and deliberate or accidental exposures to infectious biologics or other contagions), and their long-term consequences in the infrastructure (e.g., extended power outages, extended disruptions in the water systems, food supplies, communications, transportation systems and housing, economic instability, employment and occupational security, and social and other funded assistance programming). Public health emergencies may include the COVID-19 pandemic, influenza, zika, chikungunya or dengue outbreaks, and other epidemics. Disasters could be current, recent or past. Long-term is defined as 1 year or longer after the sentinel event(s).

G.  Technologies for improving the effectiveness of recruitment, inclusion, and the retention of participants from racial/ethnic minorities and sexual and gender minority populations, and from populations experiencing health disparities into clinical trials, interventions, and other studies involving human subjects.

H.  Technologies facilitating data collection under non-ideal circumstances encountered after a disaster, public health emergency, etc., and technologies for training clinicians on effective clinical recruitment designs and practices within varying contexts (e.g. rural, urban), and appropriate health services delivery at the community level.

**National Institute of Neurological Disorders and Stroke (NINDS)**

A. In vivo animal testing required for therapeutics and diagnostics development.

B. Drug and biologics preclinical discovery and development activities to support regulatory approval, such as lead identification/optimization, preclinical efficacy testing, IND-enabling studies, and manufacturing for clinical trials.

C. Device preclinical discovery and development activities to support regulatory approval, such as hardware prototyping, device/software verification, biocompatibility/sterilization testing, pre-clinical efficacy testing, large animal GLP safety testing, and preparing material/devices for human testing.

D. Clinical testing of therapeutics (drugs, devices, or biologics), diagnostics, clinical and rehabilitation tools (i.e., intraoperative technologies, rehabilitation devices and programs, and brain monitoring systems), and technologies for clinical research. This would include clinical research studies to test scientific hypothesis that are not feasible or practical to conduct in animal models but would inform a final device design.

E. In vivo animal testing of technologies for animal research and development of animal models for drug development and neuroscience research.

F. Research that requires special facilities to contain hazardous or infectious materials.

G. Development and validation of biomarkers and the technologies and approaches for measuring them. Biomarkers may include diagnostic, prognostic, monitoring, pharmacodynamic/response, risk, safety, and predictive biomarkers.

**Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative**

H. Development of research tools and technologies to understand the dynamic activity of neural circuits.

I. Development of novel tools and technologies to facilitate the detailed analysis of complex circuits to provide insights into cellular interactions that underlie brain function.

J. Development of invasive and non-invasive devices for recording and modulation in the human central nervous system.

**National Institute of Nursing Research (NINR)**

A. Development of digital health technologies that explicitly aim to reduce health disparities

B. Development of digital health technologies that incorporate elements of SDOH (conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks) to advance innovative new systems and models of care in settings where nurses practice – including hospitals and clinics, schools and workplaces, homes and long-term care facilities, justice settings, and throughout the community

C. Projects proposing clinical trials with a large number of participants

**National Center for Advancing Translational Sciences (NCATS)**

A. Innovative platforms for identification and prioritization of targets for therapeutic intervention with clear clinical impact.

B. Technologies to determine alternative uses for existing therapeutic interventions.

C. Tools and technologies to allow assaying of activities of compounds on currently "non- druggable" targets.

D. Phenotypic assay development, including stem cell technology platforms for human "disease in a dish" applications and the evaluation of toxicity.

E. Co-crystallization high-throughput screening techniques.

F. Small molecule and biologics analytical characterization.

G. Tools and technologies that increase the predictivity or efficiency of medicinal chemistry, biologic, or other intervention optimization.

H. Accelerate bioengineering approaches to the development and clinical application of biomedical materials, devices, therapeutics, and/or diagnostics.

I. Tools and technologies that increase the efficiency of human subjects research, including development of technologies that facilitate rapid diagnosis and/or clinical trial recruitment and subject tracking, IRB evaluation, and/or regulatory processes.

J. Novel platforms, technologies and tools for: (1) enabling clinical and translational research, particularly those with mechanisms for inclusion of patient reported data and (2) integration of patient data collected from multiple devices and multiple/diverse clinical studies.

K. Searchable access to information about researchers and their expertise, including but not limited to their publications, published data sets, methods, patents, clinical trials, partnerships, collaborators, and clinical specialty/expertise (if applicable).

L. Tools for meaningful sharing of research data with low barrier for provision and user friendly access.

M. Microphysiological Systems (MPS)/Tissue Chips.

**National Center for Complementary and Integrative Health (NCCIH)**

A. Development and validation of biomarkers that correlate with efficacy of complementary health approaches.

B. Formulation, development, and clinical testing of natural products that would permit FDA approval of a natural product for a specific indication.

C. Development of innovative technologies and methods to assess natural product–drug interactions in humans.

D. Nontraditional phenotypic assay development for complex natural product mixtures.

E. Integrated in silico tools for exploiting natural product bioactivity.

F. Development of non-invasive technologies and devices that enable to monitor the effects of natural product interventions on host and gut microbes along the discrete regions of the gastrointestinal tract.

G. Identification and validation of biological targets associated with complementary health approaches.
   a. The development of sensory/diagnostic devices or applications that utilize Artificial Intelligence/Machine Learning (AI/ML) to elucidate the physiological, biological, and psychological mechanisms of multicomponent interventions on health promotion and restoration, resilience, disease prevention, pain, and symptom management.
   b. Technologies for developing decision aids or tools for risk assessment and/or informed choice that utilize evidence from multiple levels and domains (e.g., social determinants of health information, electronic health record data) to promote uptake and adherence to complementary and integrative health approaches.
   c. Technologies that leverage patient generated health data to improve outcome assessment in trials of complementary health approaches or inform digital technologies to deliver tailored complementary or integrative health approaches to improve health outcomes.
   d. Technologies that address health literacy challenges that can impact engagement and treatment adherence to complementary and integrative health approaches.

H. Studies of the mechanistic effects of mind and body interventions that will allow for optimization of the efficacy and safety of the mind and body approach for commercialization.

I. Development and clinical testing of innovative technologies and methods for mind and body approaches. Examples include the use of mobile health technologies such as smartphone apps, sensors, online delivery, or phone-based delivery.
   a. Development of mobile health technologies or applications that incorporate Artificial Intelligence/Machine Learning (AI/ML) and utilize multi-dimensional data relevant to improve the efficacy of Complementary and Integrative Health approaches.
   b. Development and validation of Artificial Intelligence/Machine Learning tools that

utilize electronic health records data to predict efficacy of complementary and integrative health approaches.

J. Design, development, evaluation, and validation of devices or systems related to complementary health approaches.

    a. Development and validation (i.e., assessment of intervention acceptability, adherence, fidelity, and efficacy) of mobile/digital technologies (e.g., gaming, virtual reality, biofeedback and other technologies) involving complementary and integrative approaches.

    b. Development of tools and technology for music-based interventions.

**National Library of Medicine (NLM)**

A. Development and applications to improve storage, retrieval, access, management, representation, and use of biomedical knowledge

B. Development of tools and methods for visualization, modeling, simulation, or analysis of complex biological systems and clinical processes

C. Innovative approaches for data security and privacy, and technical issues related to other ethical, legal, and social implications of personal health data

D. Methods for data integration to support discovery, learning, and health care

E. Informatics tools that assist in delivering precision medicine to patients, or health decisions

**Division of Program Coordination, Planning, and Strategic Initiatives (DPCPSI), Office of Research Infrastructure Programs (ORIP)**

A. Development of new technologies for rapid characterization and deep phenotyping of large numbers of animals.

B. Development of technologies to identify or assess disease biomarkers in well validated animal models.

C. Development of vaccines and new therapeutic agents to prevent and/or control infectious diseases of laboratory animals. One high priority need is to develop methods to control and prevent monkey B virus (*Macacine alphaherpesvirus 1*) infections.

D. Design of specialized equipment and caging for laboratory animals to permit optimal environmental control and operational efficiency, including improvements in caging, identification/tagging of animals and remote monitoring in animal facilities.

E. Identification, development, and characterization of spontaneous and engineered vertebrate animal models for studies of various human diseases, excluding most random mutagenesis projects performed on rodents.

F. Development and refinement of high-throughput technologies and devices for the effective cryopreservation or long-term maintenance and revival of cells and tissues as well as laboratory animal embryos and gametes.

G. Development of technologies and devices for the effective monitoring of frozen and cryopreserved cells and biological materials/tissues as well as laboratory animal embryos and gametes (including monitoring conditions during their distribution).

H. Development of improved reagents, artificial intelligence/machine learning technologies, devices, and high-throughput technologies to perform, analyze, capture, and process data gathered in "omics" studies (genomics, transcriptomics, epigenomics, proteomics, lipidomics, glycomics, metabolomics, and phenomics, among others) in normal, diseased and intervention conditions in animal/biological models.

I. Development of biological tools and reagents for reconstruction, remodeling, repair, and regeneration of tissues damaged by injury or disease. Development of the technologies and procedures to test efficacy and safety of these experiments in animal models. Approaches to detect and track the implanted cells and tissues *in vivo*.

J. Development of acellular biomaterials, biosensors, and reagents to promote, detect and track the reconstruction, remodeling, repair, and regeneration of tissues and organs damaged by injury or disease.

**Advanced Research Projects Agency for Health (ARPA-H)**

A. Research and development, including pivotal studies and prototyping, of therapeutic devices to treat chronic and acute inflammatory diseases.

B. Transition and translation of therapeutics and diagnostics; including small molecules, biologics, devices (including drug delivery), and digital health and telehealth technologies; for pediatrics, rare diseases, chronic diseases, and cancer.

C. Research and development of targeted delivery technologies that cross the blood brain barrier to enable delivery of therapeutics and diagnostics to the brain.

D. Research and development of intra-operative technologies and tools such as imaging tools and systems, surgical instruments/devices and navigation systems, and hemostatic agents to translate into clinical practice for precision surgery.

**Centers for Disease Control (CDC)**

**Center for Forecasting Analytics (CFA)**
A. Create tools, products, and enterprise enhancements to make analyses of emergency response outbreak data flexible, fast, and scalable
B. Integrate novel data sources into public health decision making
C. Create tools, products, and software to translate models and forecasts into actionable information by public health decision makers
D. Improve speed and efficiency of existing analytic models through refactoring for high performance computing and multi-threaded deployments.

**Global Health Center (GHC)**
E. Advanced tools and techniques for detecting new microbes, biomarkers, and cases
F. Non-traditional surveillance tools and methods for real-time detection of emerging public health threats, including COVID-19, vaccine-preventable diseases, HIV, TB, and malaria
G. Virtual reality equipment and software to support the development of virtual laboratory environments to assess practical laboratory skill competency
H. Technologies to detect diseases faster

**National Center on Birth Defects and Developmental Disabilities (NCBDDD)**
I. Improved methods for screening for newborn heart disorders
J. Technology based solutions to improve access to evidence-based interventions to manage attention-deficit/hyperactivity disorder and tic disorders
K. Tools and technologies to improve the life of people living with birth-defects
L. Technologies that improve access of individuals with intellectual disabilities to services and evidence-based management interventions.

**National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP)**
M. Tools to increase access to health care, decision support tools to improve prevention, measurement, and management of chronic diseases
N. Applications to improve nutrition among children and adults
O. Implementation tools to improve use of evidence-based interventions such as chronic disease self-management programs
P. Design aids to increase physical activity through the built environment
Q. Tools to promote physical activity and physical activity education among children
R. Tools and technologies to improve women's reproductive health, pregnancy health and care
S. Methods to improve access to screening
T. Applications to reduce smoking and support quitting
U. Interventions to promote prevention and early detection of cancers

**National Center for Emerging and Zoonotic Infectious Diseases (NCEZID)**
    V.   Antibiotic Resistant Healthcare-Associated Infections
    W.  Vector Borne Diseases: Detection, Prevention, Diagnosis and Response

**National Center for Environmental Health (NCEH)**
    X.   Tools or technologies to assess or estimate indoor air quality and health risks

**National Center for NIH, Viral Hepatitis, STD and TB Prevention (NCHHSTP)**
    Y.   Improved Diagnostic Tests for HIV, STDs, Hepatitis and TB

**National Center for Immunization and Respiratory Diseases (NCIRD)**
    Z.   Prevention and Diagnosis of Acute Respiratory Infections in the US and Globally

**National Center for Injury Prevention and Control (NCIPC)**
    AA. Prevention and Management of Traumatic Brain Injury Among Youth
    BB. Technological Innovations to Reduce Deaths and Injuries from Motor Vehicle Crashes
    CC. Electronic Tools to Assist Older Adults at Risk for Falls
    DD. Innovative Technologies to Help Prevent Drug Overdose
    EE. Innovative Technology or Media to Prevent Violence Affecting Children/Youth

**National Institute for Occupational Safety and Health (NIOSH)**
    FF. Control Technology and Personal Protective Equipment for High Risk Occupations
    GG. Exposure Assessment Methods for High Risk Occupations
    HH. Work-related Injuries from Motor Vehicle Crashes