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LA CaTS
LOUISIANA CLINICAL & TRANSLATIONAL SCIENCE CENTER

ANALYSIS & INFORMATICS NEWSLETTER

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IN THIS ISSUE:

Welcome to the inaugural issue of the LA CaTS Analysis and Informatics e-newsletter, a joint production of the LA CaTS Design and Analysis Core and the LA CaTS Biomedical Informatics Core. Our e-newsletter will be published quarterly and will be available on the LA CaTS website.

Biomedical Informatics Core (BMI) CORE

The Biomedical Informatics Core's (BMI Core) overall objectives include:

(1) Providing LA CaTS investigators with a full range of biomedical informatics support and resources and
(2) Contributing to the development of improved informatics methodologies that support translational research.

To provide a full range of informatics support, the BMI Core consists of three units:

(1) The Clinical Trials Group
(2) The Data Access Group
(3) The Liaisons to Bioinformatics and Biocomputing Expertise

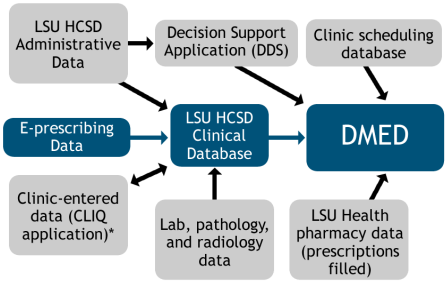
CLINICAL TRIALS GROUP

The **Clinical Trials Group** supports investigators' prospective projects that require design, creation, and storage of project databases, including enable secure short-term and long-term access to those databases. Connie Murla leads the Clinical Trials Group.

The Clinical Trials Group supports database design and data acquisition using Vanderbilt's REDCap system (http://project-redcap.org/). Both the Pennington Center and the LSU Health Sciences Center are members of the REDCap Consortium, allowing use of REDCap's rich feature set for managing research data, library standards, and workflow practices.

DATA ACCESS GROUP

The **Data Access Group** supports investigators whose needs include access to existing health-related databases and merging of data from multiple sources. This includes, for example, providing investigators with extracts from the LSU Health clinical data warehouse (see box.) Ron Horswell leads the Data Access Group.



DMED was created 10 years ago by the LSU Health Care Services Division (LSU HCSD) to enable tracking and evaluation of LSU HCSD disease management programs. DMED is accessed for that purpose by the LSU HCSD Analysis Department. Operating under IRB approvals and data use agreements, the Analysis Department also provides DMED data extracts for research purposes. A SQL Server-based relational data warehouse updated monthly, DMED contains administrative, clinical, laboratory, and medication data from the LSU HCSD. DMED data sources include LSU HCSD's Shared Medical Record Data Infrastructure (SMaRDI) which implicitly generates a nearly-comprehensive longitudinal record of patient health information. LSU HCSD is now implementing a new EMR purchased from Epic Systems (www.epic.com), internally called the Patient Electronic Information and Care Network (PELICAN.) LSU HCSD remains committed to maintaining its data warehouse concept, and is now investigating how to implement a PELICAN-populated warehouse.

CORE'S LIAISONS TO BIOINFORMATICS AND BIOCOMPUTING EXPERTISE

The **Core's Liaisons to Bioinformatics and Biocomputing Expertise** are available to help LA CaTS investigators who need consultation and collaboration on advances informatics and biocomputing needs, such as for genomic analyses, proteomic analyses, and data mining. The Liaisons are members of the Louisiana Biomedical Research Network's (LBRN) Bioinformatics, Biostatistics, and Computational Biology (BBC) core and include:

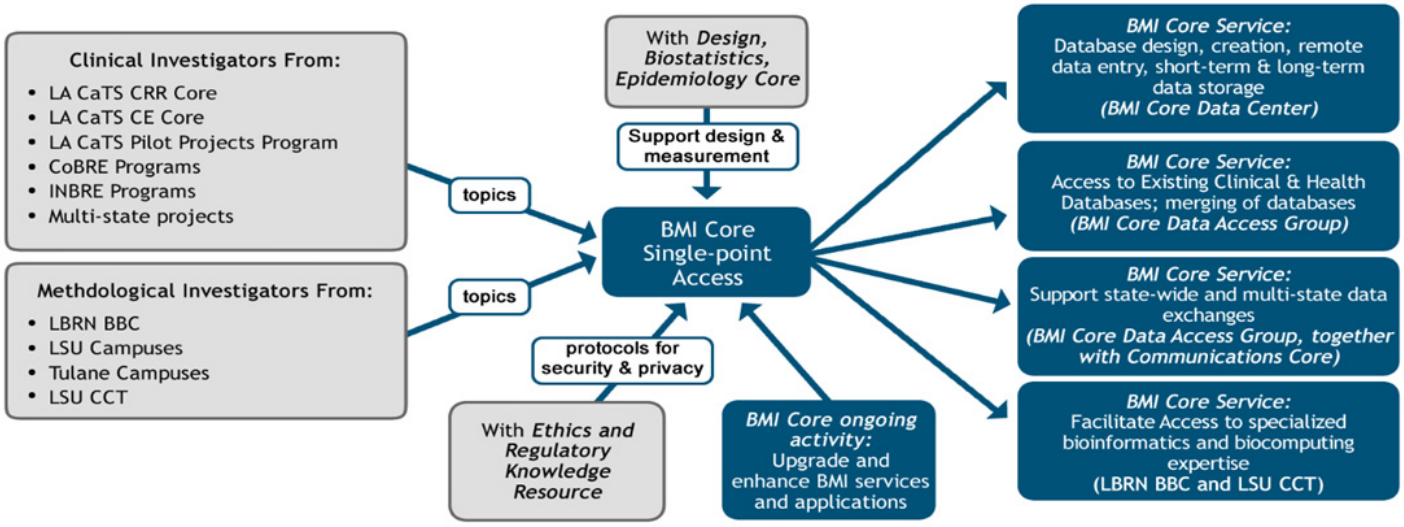
- Brygg Ullmer, PhD (LSU A&M Department of Computer Science and the Center for Computation and Technology)
- Hilary Thompson, PhD (LSU School of Public Health)
- Sumeet Dua, PhD (Louisiana Tech University)
- Zhide Fang, PhD (LSU School of Public Health)

These liaisons jointly possess a broad range of expertise. But they also are well-positioned to help investigators find and establish collaborations with methodological experts statewide. Accessible areas of expertise, as well as examples of applications developed by LBRN and CCT scientists, are shown in the box on the right.

LBRN & LSU CCT Areas of Faculty Expertise
Advanced data mining methodologies
Human-computer interfaces and interaction
Data visualization for knowledge discovery
Consultation on high performance computing (HPC)
Consultation on project design for genomics and proteomics
Methodologies for genomic, proteomic, and metabolomic analyses
Image analysis and image classification
Methodologies for rational drug discovery
LBRN & LSU CCT Developed Applications
LABiViz: visualization tools to identify patterns in biomedical data
Castle: a suite of tools for data mining, cluster analysis, & visualization of results
P3Maps: a graph-based protein structure core calculation & conformation tool
PC4: a graph-based data mining tool for analysis of protein structure
AIMS: an image retrieval and classification engine
INFUSE: a tool for information fusion from heterogeneous sources
DARE: HPC framework for Next Generation Sequencing analysis

BMI CORE OBJECTIVES

The BMI Core's objective is to provide LA CaTS investigators with a single point of access for such services and support, as shown in the following diagram:



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BMI CORE OBJECTIVES CONTINUED

The BMI Core's objective of developing improved methodologies for translational research will be led by the **Core's BMI Methodological Collaborative**. This Collaborative's mission includes creating and implementing "enabling informatics applications," defined as applications which create informatics infrastructure capable of support many future LA CaTS projects.

The BMI Core's objective also include **supporting Louisiana CoBRE programs**. Over the next year, the Core plans to conduct seminars with each Louisiana CoBRE, so as to acquaint CoBRE investigators with informatics resources available to them through LA CaTS.

Like all of LA CaTS, the BMI Core has a close working relationship with the South Carolina Translational Research (SCTR) Institute and in particular with **SCTR's Biomedical Informatics Program** (BIP.) In the upcoming months, the BMI Core will be working with the BIP on a informatics benchmarking exercise designed to identify informatics best practices that LA CaTS and LSU may wish to adopt.

Design, Epidemiology, & Biostatistics Core

The Design, Epidemiology, and Biostatistics Core's (DEBC) overall objectives include:

1. Consolidating and expanding the design, epidemiology, and biostatistics resources at LA CaTS institutions,
2. Participating in and improving methodological education of future clinical and translational researchers, and
3. Developing new epidemiologic and biostatistical approaches and methods to better support translational research. The DEBC core consists of three senior faculty members with relevant expertise in their fields who will serve as facilitators. These facilitators (see boxes on right) are affiliated with the lead and collaborating institutions that have substantial Design, Epidemiology and Biostatistics resources in Louisiana.

These faculties at the campuses of Pennington, LSU SPH and Tulane SPH have significant capacity to elevate the quality of translational research in Louisiana. There is a good mix of senior leadership and new faculty with strong commitment to classroom teaching; mentoring at undergraduate, graduate, post-doctoral and faculty levels; collaborative research heavily focused in biomedical applications that translate across the basic, clinical and population sciences; and methodological research required to meet the changing dynamics of scientific inquiry. The faculties are highly productive as evidenced by their teaching and mentoring loads, publications and extramural funding. Some of the faculty areas of specific expertise most relevant to LA CaTS are shown in the table on the following page.

THE BIOSTATISTICS DEPARTMENT AT THE PENNINGTON BIOMEDICAL RESEARCH CENTER

This department includes two full-time faculty biostatisticians, as well as several masters level statisticians. Dr. William Johnson directs that department and coordinates LA CaTS support from Pennington biostatisticians. Dr. Johnson also serves as Director of the DEBC.

THE BIOSTATISTICS PROGRAM IN THE LSU HEALTH SCIENCES CENTER SCHOOL OF PUBLIC HEALTH

The LSU SPH program includes nine full-time faculty biostatisticians. Dr. Don Mercante is the Director of that program and coordinates LA CaTS support from LSU SPH biostatisticians as well as LA CaTS support from the LSU SPH Epidemiology Program.

THE BIOSTATISTICS PROGRAM IN THE TULANE UNIVERSITY SCHOOL OF PUBLIC HEALTH & TROPICAL MEDICINE

This department includes seven full-time faculty biostatisticians. Dr. John Lefante coordinates LA CaTS support from that faculty as well as support from Tulane SPH epidemiologists.

DESIGN, EPIDEMIOLOGY, AND BIOSTATISTICS CORE CONTINUED

Key Areas of DEBC Expertise			
Epidemiology		**Biostatistics**	
Disease Prevalence	Diabetes	Sampling & Experimental Design	Multivariate Analysis
Disease Incidence	Cancer	Sample Size & Power Calculations	Nonparametric methods
Mortality Risk	Chronic Diseases	Data Management	Analysis of Survey Sample Data
Multifactorial Risk	Aging & Longevity	Statistical Estimation & Hypothesis Testing	Analysis of Observer Agreement
Genetics	Dementia	General Linear Mixed Models Analysis	Outlier Detection
Environment	Parkinson's Disease	Logistic Regression Analysis	Analysis of Incomplete (Missing) data
Behavior	Population Health	Correlation Analysis	Receiver Operating Curve Analysis
Nutrition	Preventive Medicine	Analysis of Longitudinal data	Genomic Analysis
Physical Activity	Study Design	Analysis of Categorical Data	Metabolomic Analyses
Body Composition & Obesity	Clinical Trials	Analysis of Time-to-event data	Proteomic Analysis

In addition to the specific areas of methodological expertise, the DEBC will offer LA CaTS investigators more general support including:

- **Study Design:** DEBC members will work closely with LA CaTS investigators to design efficient study plans with the goal to maximize study information while minimizing resource utilization. This will often include performing power and sample size calculations based on preliminary data.

- **Data Management:** DEBC members will work closely with the BMI Core to insure that data can be easily formatted for efficient storage and retrieval for statistical analysis.

- **Statistical Data Analysis:** Once data are collected, DEBC members will be available to perform state-of-the-art statistical data analyses and/or provide guidance to investigators who are performing simple analyses on their own.

- **Interpretation of Results:** DEBC members will assist in interpretation and concise reporting of analytic results.

- **Manuscript Writing:** DEBC members will write statistical methods sections and assist in writing results sections for joint publication manuscripts related to research supported by LA CaTS Cores and Resources.

- **Grant Writing:** DEBC members will assist in grant writing, including performing most, if not all, of the functions listed in the Planning Phase above.

The DEBC will compile a compendium of all Biostatistics resources listing areas of expertise by participating institutions and provide an easy access web-based contact system for network funded and unfunded LA CaTS researchers to match their needs with the best available potential DEBC collaborators. This will allow investigators to include epidemiologists and biostatisticians who have expertise in relevant areas on grant submissions and as consultants preferably in the planning phase but in special circumstances after the study is already underway. Thus, the DEBC will create and post on the LA CaTS Center website a list of all participating potential collaborators, along with their areas of DEBC expertise. These individuals will be invited to join a mail list service and will be kept up to date on DEBC activities and on potential investigations in which they may be able to participate. The DEBC will collaborate and consult with both junior and senior investigators on every aspect of experimental, clinical, and population studies, including design, sample size and power determination, data collection and management, statistical analysis, interpretation of analytic results, manuscript preparation and grant applications.