PROPOSAL FOR NEW MASTERS PROGRAM

University of Louisville
Institution Submitting Proposal

Master of Science in Health Data Analytics
Degree Designation as on Diploma

MS in Health Data Analytics
Title of Proposed Degree Program

EEO Status	
CIP Code	**51.2299**
Academic Unit (e.g. Department, Division, School)	**Department**
Name of Academic Unit	**Health Management & Systems Sciences**
Name of Program Director	**Bert Little, PhD**
Intended Date of Implementation	**Fall 2018**
Anticipated Date for Granting First Degrees	**Summer 2020**
Date of Governing Board Approval	
Name, Title and Information of Contact Person	**Bert Little, Ph.D.** **Professor** **Health Management & Systems Sciences** **School of Public Health & Information Sciences** **University of Louisville** **485 East Gray Street** **Louisville, KY 40202**

Date of CPE Approval

Introduction

The Department of Health Management and Systems Sciences (HMSS) proposes to offer a new Master of Science degree in Health Data Analytics. Data Analytics is the wave of the future in public health and medicine. HMSS recognizes the need to educate and train students in practical application of Data Analytics (Big Data, Big Data Science, data mining, and data warehouse technologies) to real world problems in public health and medicine to meet an immediate and rapidly increasing demand for professionals with these critical knowledge, skills, and abilities (KSAs).

Data Analytics is a vibrant area, and demand is increasing exponentially. Quality graduate programs in Data Analytics are increasingly saturated. The University of Louisville is well positioned to distinguish itself in Data Analytics in public health because: (1) SPHIS has a focus on information sciences; (2) Existing faculty bring Big Data, data mining, and data warehousing expertise; (3) Demand for Data Analytics professionals is high. The program will (a) attract more students than its capacity to serve; (b) continue to grow in the next decade; and (c) produce high quality students. High demand exists for Data Analytics graduates.

Evaluation Criteria

A. Centrality to the Institution's Mission and Consistency with State's Goals

A.1. Program Objectives

The Program's objectives are as follows:

Evidence-based Decision-making: Real-world experience in application of state-of-the-art data science tools and techniques to solve decision-making challenges in academic and business environments using health data.

Electronic Health Record Use and Security: An up-to-date and clear understanding of ethics and security mechanisms required to safeguard large-scale health data collections that contain federally protected health information (PHI) that is sensitive and critical.

Modern Data Analytic Methods: Comprehensive knowledge, skills, and abilities (KSAs) of modern data analytics, statistical analysis, and visualization tools used in large-scale health data analysis.

Very Large Databases / Data Warehouses: Solid foundational and functional understanding of database / data warehouse systems, database / data warehouse design, and information retrieval in health databases / data warehouses.

Communication of Knowledge Produced in Data Analysis: Demonstrated ability to effectively communicate to a diverse audience relevant information and knowledge derived from large data collections using a variety of visualization and presentation methods. Students will be able to translate the meaning of specific data analysis results to audiences with highly variable technical knowledge.

Training in Statistical, Advanced Data Analysis Tools, and Mathematical Principles: Training in the leading edge data analytic methods and tools, including fundamental and advanced statistical and mathematical principles that are the foundation for advanced data analysis techniques (machine learning, pattern recognition, data mining, etc.).

Health Data Specialization: Advanced training in a health data analytics that includes health data domain knowledge, which will contribute to an enriched understanding of what the analytical results mean in translation from numbers to information and knowledge.

A.2. Program and University's Mission and Strategic Plan

The Program has a strong fit within the University's mission statement:

"*The University of Louisville pursues excellence and inclusiveness in its work to educate and serve its community through:*

1. *teaching diverse undergraduate, graduate, and professional students in order to develop engaged citizens, leaders, and scholars,*
2. *practicing and applying research, scholarship and creative activity, and*
3. *providing engaged service and outreach that improve the quality of life for local and global communities.*

The University is committed to achieving preeminence as a nationally recognized metropolitan research university."

Additionally, the program will address several strategic areas identified with the University's strategic plan "*The 2020 Plan: Making It Happen*" as noted below:

1. **Educational Excellence** – The MS in Data Analytics will be a nationally recognized degree available to highly qualified students;
2. **Research, Scholarship, and Creative Activity** – SPHIS is positioned strategically because University of Louisville is located geographically in a health insurance industry hub;
3. **Community Engagement** – The MS in data analytics will draw on the UofL community and the greater Louisville Metro area for collaborations and partnerships. Collaborations have been established informally with the Kentucky Health Department, Humana, UAW/Ford, and others, and are in the process of being formalized.
4. **Diversity, Opportunity and Social Justice** – The UofL and SPHIS has a culture of diversity, and is well-known for its inclusion of LGBT and underrepresented groups.
5. **Creative and Responsible Stewardship** – UofL will have national recognition for its effectiveness as the MS in data analytics graduates enter the workforce.

A.3. Program and Kentucky's Postsecondary Education Strategic Agenda

Kentucky's Developmental goals for the public health workforce (Section 14.2) by the Cabinet for Health and Family Services stipulates: "*Increase the number of schools training public health workers that integrate specific training in the essential public health services into their curricula.*"[1] The UofL MS in Data Analytics will meet these objectives in its curriculum. The degree will be offered through the School of Public Health and Information Sciences. It is anticipated that many graduates will enter the public health workforce.

[1] Kentucky Cabinet for Health and Family Services, "Healthy Kentuckians 2010 Mid-Decade Review, Ch. 14 Public Health Infrastructure," March 2006, p. 61. <*http://chfs.ky.gov/NR/rdonlyres/85F4C333-8D69-4CCB-8D1F-A61A83320A78/0/MidDecadeReviewSummaryFinalPDF.pdf*>.

The Kentucky Institute of Public Health Practice Enhancement has also called for additional trained public health professionals for the Commonwealth: "Recent national studies have reported a shortage of trained public health professionals. In Kentucky, more than half of the public health workforce lacks formal education/training in the essential services of the core functions of public health. The viability of the public health infrastructure in the Commonwealth depends on a capable workforce fully competent to respond to the challenge of assuring health to all Kentuckians."[2]

Beyond the Commonwealth, a national shortage of public health professionals resulted in a call for more education of public health workers. A barrier to firming up the public health workforce is a "lack of formal training in public health and in the application of broad public health competencies to emerging new functions."

The Commission on the Accreditation of Health Informatics and Information Management Education (CAHIIME) is the accrediting body for graduate programs in health informatics and information management in the United States. There are currently no CAHIIME accredited programs in Kentucky. The proposed HMSS MS in Data Analytics Program is designed for the CAHIIME and American Health Information Management Association (AHIMA) accreditations.

Graduates of the MS in Data Analytics Program will have a solid foundation in the principles and issues in public health from a population health perspective, and understand how to bring empirical data analysis to bear on critical issues.

A.4. Program and Kentucky's Statewide Implementation Plan

In the 2016-2021 Strategic Agenda "Stronger by Degrees: A Plan to Create a More Educated & Prosperous Kentucky"[3], the Kentucky Council on Postsecondary Education presents a set of eleven policy objectives in the agenda. The MS in Data Analytics furthers the implementation plan primarily in the following objectives and strategies (which are reproduced in italics for contextual orientation).

- **Policy Objective 3:** *Increase participation in postsecondary education, particularly among traditionally underserved populations*
    - **Strategy 3.2**: *Expand the availability of flexible, affordable, competency-based postsecondary programs like Commonwealth College, as well as other innovative strategies like Project Graduate and employer partnerships that encourage and support working-age adults to pursue job-enhancing postsecondary credentials.*
        - The MS Data Analytics Program will serve as a feeder degree for Ph.D. graduates of the UofL Health Management Program.
        - The curriculum is offered over four semesters in the evenings and a practicum internship during the summer. For those employed in the healthcare industry, this requirement is structured to enable integration of on-the-job experience into the practicum, further facilitating employed student achievement. This allows our students to work full-time while completing their degrees. They can also take advantage of employer tuition reimbursement programs with this curriculum structure.

2 Kentucky Institute of Public Health Practice Enhancement website, *(updated February 15, 2010)*. <http://www.mc.uky.edu/kiphpe/index.html>.

3 Kentucky Council on Postsecondary Education <http://cpe.ky.gov/ourwork/strongerbydegrees.html>.

- **Policy Objective 4:** *Improve the education and skill levels of Kentucky adult education students to prepare them for careers and/or postsecondary education.*
    - **Strategy 4.2:** *Strengthen partnerships with business and industry, workforce partner agencies, institutions of higher education, and other organizations that lead to increased student enrollment and engagement in adult education programs.*

The table below identifies the organizations that were contacted about this proposed master's degree program. Given the emphasis of the UofL MS Data Analytics Program on health organization leadership, it follows that all of the organizations interviewed were extremely enthusiastic about a potentially new CAHIIM accredited MS Data Analytics Program at the University of Louisville. Health data analytics in the Louisville health industry community has a weakness in the educational offerings within the marketplace. Their employees need the training and there are no such programs within 200+ miles of Louisville.

Name of Organization	Supportive	Employees Interested
Aetna	Yes	Yes
Anthem	Yes	Yes
Humana	Yes	Yes
Norton Health System	Yes	Yes
Passport Health Plan	Yes	Yes
GE Appliances	Yes	Yes
United Health	Yes	Yes
UPS	Yes	Yes
UNUUM	Yes	Yes

- A UofL Healthcare Leadership Advisory Board was created in 2016 that most recently met on October 27, 2017. The board's membership includes 18 healthcare executives that represent 16 healthcare companies in the region. The minutes from the most recent meeting and a list of the members are included in appendix (3). The following highlights comments from board members with regard to the proposed program:
    - *MSHDA: Members were particularly enthusiastic about the prospects of new graduate program focused on the analysis of health data to drive more effective and efficient population health decision-making. Several members representing both institutional and nationally-based healthcare management organizations noted that this degree program meets compelling current and future needs for competency development. Members inquired about the prospects of introducing artificial intelligence into the curriculum. Members representing health systems and health consulting organizations strongly advocated for opening admissions to this degree and that their organizations would be eager employers of graduates.*
- In response to the above: AI (artificial intelligence) is already embedded in the program. The techniques of AI are taught in the Data Mining I and Data Mining II courses. For marketing purposes, we will make this aspect more explicit.
- Additionally, we will develop promotional materials for the program for distribution at professional meetings attended by both industry representatives and potential students. The program director will represent and promote the program when in attendance. Examples of these meetings include:

- *KDD Nuggets (the premiere data mining meeting)*
- *ACM Data Mining SIG*
- *IEEE Computer Society*
- *Society for Applied and Industrial Mathematics*
- *American Public Health Association*
- *American Association for Public Health*
- *Data Analytics for Healthcare*
- *World Congress on Predictive Analytics Conference*
- *Annual Advanced Healthcare Analytics Conference*
- *Big Data and Analytics in Healthcare*

- **Policy Objective 6:** *Increase persistence and timely completion for all students at all levels, particularly for low-income and underrepresented minority students.*
  - **Strategy 6.1:** *Improve student advising by faculty and professional advisors by focusing on effective practices and the role of advising in retention and graduation.*
    - CAHIIM, the MS in Data Analytics Program accrediting body, provides very specific guidance on how to structure advising practices which insure optimal retention and good employment opportunities for graduates. All MS in Data Analytics Program graduates are expected to be employed within 90-days of graduating from a CAHIIM accredited Program. Advising processes for faculty and mentors in the healthcare analytics community are designed to achieve this outcome.
    - The UofL MS in Data Analytics faculty is diverse (i.e., gender, ethnicity) and located in an urban setting. The Program has access to a diverse student pool, as has historically been part of the University mission.

- **Policy Objective 8:** *Promote academic excellence through improvements in teaching and learning.*
  - **Strategy 8.2:** *Provide more pedagogical training and professional development opportunities to strengthen learning and improve student success.*
    - Healthcare management is information-intensive data-centric. All required courses in the MS in Data Analytics Program include the use of data, information, research methods, or technology, focus on the translation process: numbers → data → information → actionable analytic results. (For complete details, see the full listing of coursework in section B.12, below.)
    - The Program's courses are designed to include i2a principles, especially active learning (e.g., think-pair-share, iClickers). Active learning aims to establish and maintain cognitively active students in the classroom for lectures, group activities, and other pedagogical techniques. The intent is not only to improve learning and thinking but also to develop lifelong learners and to increase retention and graduation rates.
    - These teaching techniques are non-traditional and require educating faculty using UofL resources like the Delphi Center to improve pedagogical capabilities.

- **Policy Objective 9:** *Improve the career readiness of postsecondary educational graduates.*

- **Strategy 9.1:** *Make career development a state and institutional priority and a key strategy for student success. Improve career development through earlier advising efforts, clearly articulated career pathways, degree maps, tools that match skills to jobs and students with employers, and entrepreneurship training.*
    - An advisor is assigned to each student based on his or her career emphasis. The advisor works closely with the student to make sure that he or she is prepared to maximize job prospects at graduation.
    - The Program administrative staff will link students with career services at UofL as appropriate. These can include basics like resume writing and job searching, but can also include topics like interviewing skills and salary negotiation.
- **Strategy 9.4:** *Work with the employer community, foundations, and state agencies to provide "work and learn" opportunities, including experiential or project-based learning, co-ops, internships, externships, and clinical experiences.*
    - The MS in Data Analytics Program courses draw from real world projects gathered from the local healthcare industry.
    - The practicum will be with an organization that routinely uses health data for research and business operations. The purpose is to place students in an environment that will deepen their understanding and practical experience in real problem solving in an operating organization. This experience is intended to provide role model mentoring for the student.
    - Students can apply what they learn in class for a real-time return on investment in their jobs. Thus, employers receive an almost immediate return on their educational dollar investment through a "learn and work" model.
- **Strategy 9.5:** *Promote regular, meaningful employer involvement in the development and evaluation of postsecondary programs that are relevant to their business/industry.*
    - Representatives in the healthcare industry were consulted about the MS in Data Analytics curriculum and continue to offer quality improvements through meetings and solicited feedback.

- **Policy Objective 11:** *Expand regional partnerships, outreach and public service that improve the health and quality of life of Kentucky communities.*
    - **Strategy 11.1:** The MS in Data Analytics Program and its population health focus will graduate students with a skillset that will enhance the quality of healthcare received in Kentucky communities.
    - **Strategy 11.2:** The MS in Data Analytics curriculum was developed in consultation with industry leaders about best practices for entry-level and mid-career analysts within the healthcare industry.

B. Program Quality and Student Success

B.1. Student Learning Outcomes of the Program

The MS in Data Analytics Program will focus on four competencies:

1. Public health knowledge
2. Data warehouse development for health data analytics
3. Health data analytics
4. Translation of data analytics into actionable knowledge

M.S. Data Analytics		***Required Courses and Learning Experiences***												
Mapping of Competencies to Curriculum														
Competency	**PHPH 523**	**PHST 661**	**PHST 662**	**PHEP 622**	**PHST 710**	**PHMS 643**	**PHMS 641**	**PHMS 642**	**PHMS xxx *Data Security***	**PHMS xxx *Leadership***	**Practicum**	**PHST 691**	**Thesis**	**Thesis Defense**
Public health knowledge	P			P									R	R
Data warehouse development for health data analytics						P			P	R	R		R	R
Health data analytics		P	P		P		P	P			R	P	P	R
Translation of data analytics into actionable knowledge	P			P	R		R	R		P	P		P	R

P=Primary; **R**=Reinforcing

The following tables details the required courses and learning experiences noted above.

PHPH-523 Public Health in the US	PHMS-643 Data Management in Health Service Research	PHMS-xxx Leadership in Health Information Management
PHST-661 Probability	PHMS-641 Data Mining I	PHMS-xxx Health Information Management in Public Health
PHST-662 Mathematical Statistics	PHMS-641 Data Mining II	PHMS-xxx Health Data Analytics Practicum
PHEP-622 Population Pathology	PHMS-xxx Data Security & Electronic Health Records	PHST-691 Bayesian Inference & Decision
PHST-710 Advanced Statistical Computing	PHMS-xxx Master's Thesis Research	

Each competency will be demonstrated through the following student learning outcomes (SLOs) for the MS in Data Analytics Program:

SLO Public Health Knowledge

Population Health – The concepts of population health are essential to meaningful analysis of health data. Components of population health are very frequently the targets of analysis and serve to provide a framework for data analytics.

Communicable Diseases – The ability to use health data to analyze data on communicable disease prevention is a key skill in public health knowledge.

Chronic Diseases – Analytical skills for assessing data on chronic disease progression and treatment are especially important in modern public health programs, and ties data, knowledge and action together.

Environmental Health – A central theme in health data analytics is the ability to link population health to determinants of environmental health. Health data analytics must integrate environmental health into a comprehensive systems picture of population health because of the major role this domain plays in human health.

Healthcare and Health Equity – Inter-group health disparities have a strong causal link with health equity differences. Programs to improve population health must be linked to variable healthcare

quality, access, and use. Health data analytics of these uneven landscapes are essential to program development and improvement that impact population health.

Health informatics – Health data analytics must work in concert with informatics because in many contexts health informatics will be a primary data source.

SLO Data Warehouse Development for Health Data Analytics

Acquisition of Healthcare Data – The first step in the process of building a data warehouse is acquisition of data from many disparate sources. Identification of health data sources and acquiring these data is a logistical and policy process.

Database Joins, Data Harmonization – Disparate, disjoint data characterize health data. Data warehouses are designed to bring together data from many different sources, and data from different levels (i.e., individual, aggregate groupings) into a single version of the truth that can be analyzed.

Cross-validation of Data Warehouse Components – Data warehouses must be tested for validity of assumptions in their construction. Cross validation techniques are used in the construction and continuing review of data warehouses to assure legitimacy of subsequent analyses.

Data Marts for Sub-analyses – Data warehouses are infrequently used in specific analyses because of computational logistics, but also to preserve the integrity of the data warehouse. Therefore, data marts are usually the analytical unit.

Data Preparation for Analytics – Numeric encoding of information is often not optimal in the form in which the data are stored. Students will learn how to use ETL (extraction, transformation, load) tools, including the ability to manually perform these functions. Following data preparation, the goal is for the data to be encoded and scaled properly for use in data analytics. Importantly, improperly prepared data usually results in sub-optimal analytic results, which can lead to spurious results and poor or inaccurate conclusions.

SLO Health Data Analytics

Identification of Public Health Problems in Terms of Database Queries – The ability to cast health problem questions in terms of database items is central to health data analytics. This skill is developed through hands on experience with data warehouses and specific public health questions.

Application of Appropriate Data Analytic Techniques – A common thread in all skills developed in the health data analytics program is growing the ability to choose analytical techniques appropriate to the (a) problem under analysis, and (b) data available (and information needed) to address specific lines of inquiry.

Perform Analytics and Results Review / Discussion – The ability to describe in professional and lay terms data analytic results is developed throughout the course of study in the MS in Data Analytics through computer analyses and classroom discussion and presentation.

Translation of Statistics into Public Health Terms – Translation of analytical statistics into public health terms is developed and practiced through classroom activities, presentations to groups outside the classroom, and written reports for coursework and non-academic consumers of information.

SLO Translation of Data Analytics into Actionable Knowledge

Quantitative Results Interpretation – The ability to interpret quantitative results is learned in the coursework. The ultimate demonstration of the ability to interpret analytic results is demonstrated in the MS thesis.

Qualitative Results Interpretation – Qualitative results are often obtained in the process of integrating statistical results with non-quantitative information such as programmatic expectations and program activities. Weaving qualitative and quantitative information into plans of action culminate in the ability to synthesize information into knowledge.

Translation of Analytical Results into Public Health Practices – The ability to translate analytical results into public health practices is the ultimate success of a program of health data analytics. Using quantitative information from data analytics to derive actionable knowledge is the overarching student learning outcome.

B.2. Achievement of Student Learning Outcomes

Each of the Health Data Analytics competencies are mapped to the course learning objectives in the curriculum. Based on the Bloom's taxonomy for the learning objective and the competency level assessments are assigned for the competency within the course. The success of the curriculum in teaching competencies is measured in the following ways:

1. **Self-Assessments during the Program** – Each student will complete a set of self-assessments that measure their analytics competencies using a standardized AHIMA pre-test. These assessments are completed at the beginning, middle, and end of the Program. In addition, self-assessments built into many of the courses in the curriculum.
2. **Exit Interview** – All graduating students complete an online assessment and are interviewed by the Program Director to determine how successfully the curriculum improved the student's competency attainment while in the Program.
3. **Alumni Survey** – All graduates will be asked to respond to a survey three and five years post-graduation. These surveys will measure how they perceive their competency attainment in the Program based on their work experience in the field.
4. **MS in Data Analytics Thesis** – Students are expected to apply the competencies that they learn throughout the curriculum to their MS thesis. The competency attainment proficiency should be reflected in the quality of the thesis

B.3. Distinctive Qualities of the Program

The Program has the following distinctive qualities:

- Will be the only CAHIIM accredited MS in Data Analytics Program in Kentucky.
- Designed to be taught as a single degree with an evening course curriculum for students who continue to work full-time.
- Will be located in a Council on Education for Public Health (CEPH) School of Public Health and Information Sciences, making it the only Public Health based MS in Data Analytics Program in Kentucky.

B.4. Effects on Existing Programs

The Program does not replace any degree in the School of Public Health and Information Sciences. The Program will broaden the degree offerings for the School, and bring a degree that is in high demand in the state of Kentucky, regionally, nationally, and internationally.

The College of Business at UofL is currently proposing a Master of Business Analytics degree program. The MS in Health Data Analytics is significantly distinct in content and focus from the concurrent proposal for the Master in Business Analytics and the two degrees target largely different audiences. Potential overlap of content between certain courses in both degrees has been addressed in a letter of mutual collaboration and support signed by the deans of the School of Public Health and the College of Business. The letter is included in **Appendix 3** below.

B.5. Accrediting Agency

The accrediting agency is the Commission on Accreditation for Health Informatics and Information Management Education (CAHIIM) and we will seek CAHIIM accreditation. Eligibility for accreditation is dependent upon several criteria, one of which is having an approved Program.

From CAHIIM's website *<http://www.cahiim.org/him/accreditationstandards.html>:*
Appendix 1 provides information on CAHIIM accreditation, including initial accreditation, the application process, timeline, conditions for pre-application, etc. The full accreditation manual provides greater detail *<http://www.cahiim.org/documents/0415%20Accreditation%20Manual.pdf>*.

> *"Prior to the application process, a sponsoring institution must develop a program that meets the professional curriculum content and quality of the program as measured by the Health Information Management (HIM) Accreditation Standards. Program administrators must ensure that the program is sustainable per its resource and needs assessment. The program must be developed to ensure stability professionally and financially."*
>
> *"Timing: Program assesses readiness for application for accreditation. A program must not apply until 6 months before the date of the first graduation class.*
>
> *The following requirements must be met or completed during this stage in development and when submitting an application:*
>
> *Program Director: Have hired a permanent Program Director that meets the minimum qualifications in the Standards for a Program Director. The position must be full time throughout the application process.*
>
> *Full-Time Faculty Member: This individual must report to the qualified Program Director.*
>
> *Applicant Program Campus: The program and campus applying for accreditation must award the degree which includes online applicant campuses.*
>
> *Other campus institutional requirements: The sponsoring institution is accredited by a regional or national accrediting institutional agency recognized by the U.S. Department of Education (USDE) to offer a degree or the sponsoring institution is accredited by a national accreditor with USDE provisions in their Grant for Accreditation for establishing eligibility to participate in Title IV programs. Upon request, the applying campus program must provide the OPEID number assigned by the U.S. Department of Education as proof of participation for financial aid. State Board of Education approvals must also be completed."*

"Programs that meet the minimum requirements for application must submit a Letter of Intent that describes the readiness to pursue Initial Accreditation from the President/chief executive officer. The letter must be submitted 3-6 months in advance of the full application."

B.6. Faculty Resources

Appendix 2 provides a roster of HMSS and SPHIS faculty members who are committed to teaching and advising in the Program. As of this proposal's submission, we have 13 faculty members and, among them, have sufficient teaching effort available to teach this curriculum. All SPHIS faculty are credentialed by both SACS and CEPH to teach at the graduate level.

Faculty who teach graduate-level courses offered by the school must meet the requirements stated below, which are consistent with the University of Louisville faculty credentials policy and the guidelines of the Southern Association of Colleges and Schools (SACS) and which were accepted by the university and SACS during the most recent SACS accreditation cycle.

To teach graduate-level courses offered by the school, a faculty member must meet any of the following:

- Doctoral degree (Dr.P.H., Ph.D., D.Sc., or equivalent) from an accredited school of public health
- Doctoral degree (Ph.D., Dr.P.H., D.Sc., or equivalent) from an accredited U.S. institution in epidemiology, biostatistics, environmental health, occupational health, behavioral science, health education, decision science, health management, health policy, or other recognized public health-related discipline
- M.D., DMD, or DDS from an accredited U.S. institution
- Terminal degree (Ph.D., D.Sc., J.D., Ed.D., or equivalent) from an institution or in a field not cited above; and recommendations by the department's chair and executive faculty and approval by the dean, both of which are based on one or more of the following considerations, as appropriate:
    - Terminal degree area of study, research, and other educational activities
    - Scholarship in a field cited above or considered relevant to public health
    - Experience in a field cited above or considered relevant to public health

B.7. Library Resources, Facilities and Equipment

Library resources and access to them are more than adequate based on experience with our existing programs. The breadth of public health-related journals is excellent; all key publications are included in the library's collection. Electronic access to restricted library holdings is available to students, staff, and faculty via the Internet, allowing the level of access that is required for students in the Program. **Appendix 3** includes a letter of support for the MS in Health Data Analytics provided by the Dean of University Libraries.

The Program utilizes the classrooms and is housed in SPHIS offices on the University's Health Sciences Center (HSC) campus. The facilities include the instructional equipment needed in the Program's courses (viz., digital projector and Internet access). SPHIS has an inventory of instructional laptops available for the few classrooms not equipped with a computer.

B.8. Student Admission, Retention, and Completion Standards

Admission: The M.S. program is available to students who have completed an undergraduate degree in biostatistics, statistics, mathematics, computer science or a related discipline and have competency in college-level calculus, statistics, regression analysis, as evidenced by transcripts from postsecondary institutions attended by the applicant. This program is available to both part-time and full-time students; however, the part-time student must be cognizant that courses are offered on an alternating basis, usually every two years. Thus, part-time students must pursue the recommended course sequence, as courses are available.

The following are additionally required for admission:

- Graduate application submitted to the School of Interdisciplinary and Graduate Studies (SIGS). Website:louisville.edu/graduate/
- Non-refundable application fee
- At least two letters of recommendation written within past twelve months (submitted with form at http://graduate.louisville.edu)
- Students are asked to submit a current curriculum vitae (CV)
- Submission of GRE Quantitative section score to SIGS
- All postsecondary transcripts (requires foreign credential evaluation if not from accredited U.S. institution)
- Statement of goals (i.e., general research interests)
- Admission interviews by the HMSS Health Leadership Committee are required and are in addition to your application for admission. An interview provides the HMSS Health Leadership Committee an additional source of information and perspective about your potential fit for the University of Louisville.
- If candidate's primary language is not English, one of the following:
  - Test of English as a Foreign Language (TOEFL) exam with a minimum score of 250 (after conversion for test type)
  - Passing the exit examination for the advanced level of the Intensive English as a Second Language Program at the University of Louisville
  - Degree from an accredited U.S. institution

Retention and Completion: On matriculation, each student is assigned a faculty advisor and is requested to meet at least twice each semester with his or her advisor. The faculty advisor works with the student to develop a program of study and serves as academic mentor and counselor on career and employment opportunities, professional development, and opportunities beyond graduate school. Students in the Program must maintain a minimum 3.0 GPA in coursework. The expected faculty to student ratio after five years is 1:3.

B.9. Degree Completion Requirements

To graduate, students must successfully complete the 41 credit hour curriculum and thesis, and have an overall 3.0 GPA in coursework. All courses within the curriculum are required and there are no electives.

B.10. Degree Credit Hours

There are 41 total credit hours in this curriculum, broken down as follows:

- 35 credit hours of required coursework
- 3 credit hours of thesis research
- 3 credit hours of project management (practicum/internship)

There are no electives or concentrations in the program.

B.11. Articulation with Related Programs in Kentucky

There are no comparable programs in other schools of public health in Kentucky. There are no programs associated with a school of public health, healthcare, or medicine within 200 miles of Louisville. There is one unranked Master's program within 200 miles of Louisville at IU-Bloomington. This program has technical rigor and is geared mainly to computer science and mathematics majors. The College of Informatics at Northern Kentucky University offers an M.S. in Health Informatics through their Business Informatics program with three electives in analytics. Other programs within regional proximity to UofL include programs at Ohio State University, IU-Bloomington, and IUPUI (Indiana University-Purdue University-Indianapolis). IU has two certificate programs (School of Business, School of Informatics and Computing), as well as M.S. degree programs in the each school. At the present time, we have not discussed formal articulation agreements with any of these somewhat related programs.

B.12. Coursework

The program of study in the MS in Health Data Analytics is designed to train students in fundamentals of public health, data warehouse/database creation and management, compliance with Federal codes and regulations regarding PHI, and advanced analytics skills.

The program of study is designed to guide the learning experience through increasingly challenging courses. The first semester is an introduction to public health fundamentals, data management, probability theory, and Leadership in Health Information Management. The spring semester year one includes a course in Population Pathology as well as a course that covers Federal codes and regulations that cover PHI, in particular the sections that pertain to the electronic medical record, and mathematical statistics.

During Summer I, the student will complete an internship/practicum in health data analytics/ informatics.

The second year provides a focus on advanced analytics. A two-semester sequence in Data Mining (I and II) covers the major techniques for Big Data analytics. Fall semester year two also includes a course in Advanced Statistical Computing, and the Master's Thesis research. The second year spring semester advances public health knowledge with a course in health information management (health law/ethics, health finance, human resources, quality assurance and information management) and a course in Bayesian Inference and Decision Making.

A sample course syllabus is included in **Appendix 4**. The following table provides a description of the coursework.

MS in Health Data Analytics Courses				
Prefix & Number	**Course Title**	**Course Description**	**Credit Hours**	**Status**
PHPH-523	Public Health in the U.S.	Course covers the history of and issues facing public health in the U. S.	2	current
PHMS-643	Data Management In Health Service Research	The goal of the course is to build data structure foundations for students in health management emphasizing in health data analytics, the basic skills needed to organize, assess and analyze data sets. The course discusses a variety of tools (file systems, database systems, and the SAS environment) as well as a series of basic tasks, from generating metadata to basic filtering, organizing and enrichment of data sets. This course contributes to the development of analysis, modeling and problem-solving skills.	3	new
PHST-661	Probability	Introduction to probability theory. Topics include axioms of probability, conditional probability, discrete and continuous random variables, probability distributions and joint distributions, moments, moment generating functions, mathematical expectation, transformations of random variables, limit theorems (Law of Large Numbers and Central Limit Theory).	3	current
PHMS-XXX	Leadership in Health Information Management	Leadership in health information management (HIM) includes development of leaders in HIM develop, the usual daily workflow, how they manage and lead. The need for HIM leadership is growing in number of positions, and importance of their roles in healthcare delivery organizations. Healthcare systems are redefining the way health information is collected, processed, used, stored, and retrieved. The paradigm shift is caused largely by (1) healthcare providers' transitioning from paper-based medical records to electronic medical records, (2) transition to the use of computer-automated data processing, and (3) computer automated data entry through voice recognition and computer-assisted CPT and ICD coding schemes. Shifts in technology affect management of data and human resources. Knowledge, skills and abilities needed to manage health information and health information systems will be taught in the classroom and practice in a laboratory environment.	3	New
PHEP 622	Population Pathology	This course introduces students to the physiologic measures and biomarkers that are used by public health researchers and practioners to assess the health status of populations.	3	current
PHST 662	Mathematical Statistics	A first course in statistical theory. Topics include limiting distributions, maximum likelihood estimation, least squares, sufficiency and completeness, confidence intervals, Bayesian estimation, Neyman-Pearson Lemma, uniformly most powerful tests, likelihood ratio tests and asymptotic distributions.	3	current

MS in Health Data Analytics Courses				
Prefix & Number	**Course Title**	**Course Description**	**Credit Hours**	**Status**
PHMS-XXX	Data Security and Electronic Health Records	Data security of electronic health records (EHRs) is a major issue in contemporary health data computing environments. Security lies at the heart of barriers to data access and use in hospitals, insurance companies, and Centers for Medicare and MEDICAID Services (CMMS, aka CMS). Data use restrictions center on the storage and access security of physical repositories of health data. Qualifications of personnel allowed to work with sensitive protected health information (PHI) center on "trust." Trustworthiness is scored on a work history of working with PHI without incident. The student shall learn the federal codes and regulations that govern access to PHI. The EHR is encoded in the International Classification of Diseases (ICD) in least two versions the ICD-9 and ICD-10. The student will learn how to navigate the ICD coding schemes to extract analytical data.	3	new
PHMS-XXX	Health Data Analytics Practicum	The practicum experience places the student in a non-academic environment where health data analytics are used for decision support and strategic planning. The deliverables will (1) be specific to the site where the practicum is completed and (2) a written report to the instructor on the experience gained during the practicum. The practicum should include no less than 200 contact hours at the practicum site. The manager at the practicum site will be asked to complete an evaluation of the student	3	new
PHMS 641	Data Mining I	The course is first in a two semester sequence graduate level introduction to data mining/big data analytics. It focuses on practical implementation and interpretation of the most commonly used techniques in analysis of very large datasets.	3	current
PHST 710	Advanced Statistical Computing I	The intent of this course is to develop knowledge of a statistical programming language and computational methods that are essential to statistics. The course primarily focuses on the R programming language and covers a variety of programming topics related to R (vectorization, data l/O, object-oriented programming, and building R packages). Statistical and computational methods that are covered include visualization (basic and lattice graphics), data smoothing, optimization (Newton-Raphson and EM-algorithm), matrix factorization, simulation (inverse transform and acceptance-rejection methods, power and size of a test), numerical integration, resampling (bootstrap and permutation tests), and other modern statistical methods.	3	current

MS in Health Data Analytics Courses				
Prefix & Number	**Course Title**	**Course Description**	**Credit Hours**	**Status**
PHMS-XXX	Master's Thesis Research in Health Data Analytics	This course consists of research on health data analytic methods for public health data analysis and in observational studies. The student will conduct independent research and understand appropriateness of different methods, and be able to apply appropriate methods to analyze health data from heterogeneous sources. Based upon the data collected for research the student will develop a written thesis detailing analytic methods, results, and be able to translate the results into actionable knowledge in public health.	3	new
PHMS 642	Data Mining II	This is the second of a two semester graduate level course on data mining/big data analytics. It focuses on practical implementation and interpretation of the most commonly used techniques in analysis of very large datasets.	3	current
PHMS-XXX	Health Information Management in Public Health	Object-relational databases, extended relational databases, and semi-structured data are used in a health informatics environment. Design, query languages, query processing, and optimization in data warehousing will be used to explore data management concepts and practices. Integration of heterogeneous data is a critical issue in the Big Data environment because much information needed to effectively management analytic requirements is available from disparate sources. Knowledge, skills and abilities necessary to assemble sources needed for effective analytics operations will be taught in a classroom / laboratory environment.	3	new
PHST 691	Bayesian Inference and Decision	Focuses on the use of Bayesian probability and statistics in both scientific inference and formal decision analysis. The frequency and subjective interpretations of probability are explored, as well as probability and decision making. The course will explore inference for both single-parameter, multiple-parameter, and hierarchical models. A significant amount of time will be devoted to Bayesian computational methods.	3	current

B.13. Planned Alternative Methods of Program Delivery

No alternative methods of program delivery are currently under consideration.

C. Program Demand/Unnecessary Duplication

The *US Bureau of Labor Statistics Occupational Outlook Handbook* produced a special edition on data sciences related positions in 2013. The information is four years old but is still correct in its assessment that Data Analytics (Big Data, data mining, predictive analytics, etc.) is a growth area, experiencing a conservatively estimated 15% increase in demand per annum.

"Big Data" captures not only a wide swath of high technology KSAs, but also has attracted the attention of the high finance press corps. *Forbes* Magazine *Tech Section* notes:

"Workers who use big data are employed by many kinds of institutions and in many different industries: government, businesses, financial institutions, healthcare, scientific research facilities, colleges and universities, and others. The collection and use of big data continues to expand in all of these." (*Forbes Magazine, December 29, 2013*)

Nationally, only eight programs specifically address Big Data and public health showing the presence of a Data Analytic Program, and include at least some coursework or concentrations in a Master's degree program.

- Harvard School of Public Health
- Johns Hopkins School of Public Health
- University of Michigan School of Public Health
- University of Minnesota School of Public Health
- UCLA School of Public Health
- University of New Mexico School of Public Health
- Emory School of Public Health
- UC-Berkley School of Public Health

C.1. Student Demand

Evidence for student demand comes from a variety of sources. At the local and regional levels evidence for demand for an MS in Data Analytics has come from in-person and telephone conversations, and e-mails. The Data Mining I course (Fall 2017) attracted students from Humana, Anthem, and UPS. These interests developed from personal knowledge of students previously mentored by Dr. Little, resulting in informal referrals.

Formal student recruitment will be through internal and external efforts. Internally in the School of Public Health all degree advisers will be briefed in-person regarding the program, and provided written documentation. Externally, we will use professional and lay publication sources to raise awareness regarding the ne MS in Health Data Analytics. The following meetings attract large numbers of potential applicants: KDD Nuggets Data Mining Meetings; Society of Applied and Industrial Mathematics – Data Mining SIG; and Association of Computing. The following table provides an estimate for student demand for the first five years of the program.

Academic Year	Degrees Conferred	Majors-Headcount Fall Semester
2018	0	10
2019	0	15
2020	8	20
2021	12	20
2022	17	20

C.2. Employer Demand

In 2015 the Mckinsey Group stated:

"Analyzing large data sets—so called big data—will become a key basis of competition, underpinning new waves of productivity growth, innovation, and consumer surplus as long as the right policies and enablers are in place. Research by MGI and McKinsey's Business Technology Office examines the state of digital data and documents the significant value that

can potentially be unlocked. However, companies and policy makers must tackle significant hurdles to fully capture big data's potential - including a shortage of skilled analysts and managers. The United States alone faces a shortage of 140,000 to 190,000 people with analytical expertise and 1.5 million managers and analysts with the skills to understand and make decisions based on the analysis of big data." *(http://www.mckinsey.com/).*

The most recent information regarding demand for data analytics is from IBM Corporation *(https://www.forbes.com/sites/louiscolumbus/2017/05/13/ibm-predicts-demand-for-data-scientists-will-soar-28-by-2020/#5c5ae3b17e3b)*:

- Jobs requiring machine-learning skills are paying an average of $114,000. Advertised data scientist jobs pay an average of $105,000 and advertised data engineering jobs pay an average of $117,000.
- 59% of all Data Science and Analytics (DSA) job demand is in Finance and Insurance, Professional Services, and IT. These include population health and health insurance industries.
- Annual demand for the fast-growing new roles of data scientist, data developers, and data engineers will reach nearly 700,000 openings by 2020.
- By 2020, the number of jobs for all US data professionals will increase by 364,000 openings to 2,720,000 according to IBM.
- Data Science and Analytics (DSA) jobs remain open an average of 45 days, five days longer than the market average.

Perhaps most notably from the IBM market assessment is the statement *"...59% of the jobs will be in insurance*." Notably, more than half of the insurance jobs are in the health insurance sector, which requires experience in health data analytics.

Career examples are provided in **Appendix 5**.

C.3. Academic Discipline Needs

Response provided for C2.

C.4. Similar Programs

As shown in the following table, of the top 20 programs in data analytics in the US and Canada, only the University of Cincinnati is geographically close to Louisville.

Institution	School	Program Length
Bentley University	Graduate School of Business	18 M
Carnegie Mellon University	Public Policy & Info Systems	16 M
Columbia University	Eng & Applied Science	2 Y
DePaul University	Computing & Digital Media	2 Y
Drexel University	College of Business	1 Y
Harvard University	College of Business	1 Y
Louisiana State University	College of Business	1 Y
MIT	School of Management	2 Y

Institution	School	Program Length
New York University	School of Business	2 Y
North Carolina State University	Inst for Advanced Analytics	10 M
Northwestern University	Eng & Applied Sciences	15 M
Rutgers University	School of Business	2 Y
Stanford University	School of Eng/Dept CS	2 Y
University of Cincinnati	College of Business	1 Y
UC-Berkley	College of Engineering	10 M
University of Connecticut	College of Business	1 Y
University of Illinois-U/Ch	Graduate College/Dept Stats of Business	1 Y
University of Ottawa	School of IT & Engineering	16 M
University of Tennessee	College of Business Admin	2 Y
York University	School of Business	1 Y

*(**Source**: Information Week, January 2013)*

The University of Cincinnati program is focused on business analytics, but the program is shorter and requires less technical savvy than the degree we propose at UofL.

One of the shortest duration programs is at North Carolina (NC) State, but they are highly selective in admittance. The NC State program is business focused. UC-Berkley is another 10-month program, but it has more mathematical rigor than the one in North Carolina.

The curricula most comparable to the Master's degree program proposed at the UofL are at Columbia, DePaul, MIT, New York University, Rutgers, Stanford and Tennessee because they are two year programs that are demanding in technical skills (computer science, mathematics), rather than a two-semester program. The objective of the UofL program is to provide world class training that will be competitive in national and global markets.

The College of Informatics at Northern Kentucky University offers an M.S. in Health Informatics through their Business Informatics program with three electives in analytics. There is one unranked Master's program within 200 miles of Louisville at IU-Bloomington. This program has technical rigor and is geared mainly to computer science and mathematics majors. There were no other programs associated with a school of public health, healthcare, or medicine within 200 miles of Louisville.

There are no similar programs present in Kentucky. Please see section **B. 4** above (p 11) and letter of collaboration with College of Business in **Appendix 3** below regarding concurrent proposal of the Master of Business Analytics degree program.

D. Cost and Funding of the Proposed Program

Minimal additional funding will be required to initiate the program. Of the fourteen courses required in the curriculum for the proposed program, eight are courses currently being offered by the university. The six new courses not currently offered will be taught by the program director.

Tuition revenue generated by the proposed program will be collected centrally. All courses will be taught by existing faculty.

- *Will this program require additional resources?*
  Yes, the program does request $10,000 per year in Years 1 and 2 for startup marketing expenses and $10,000 per year for the first five years in travel expenses. There may also be small buyouts of faculty time for courses based on enrollment growth and the need for additional sections of existing courses.
- *Will this program impact existing programs and/or organizational units within your institution?*
  No, there are no comparable programs currently offered at the university.
- *Provide adequate documentation to demonstrate sufficient return on investment to the state to offset new costs and justify approval for the proposed program.*
  Please see the tables provided below.

Cost/Funding Explanation
The following budget provides data for funding and expenses.

A. Funding Sources, by year of program	**1st Year**	**2nd Year**	**3rd Year**	**4th Year**	**5th Year**
Total Resources Available from Federal Sources					
New	$0	$0	$0	$0	$0
Existing	$0	$0	$0	$0	$0
Narrative Explanation/Justification: Not applicable					
Total Resources Available from Other Non-State Sources					
New	$0	$0	$0	$0	$0
Existing	$0	$0	$0	$0	$0
Narrative Explanation/Justification: Not applicable					
State Resources					
New	$0	$0	$0	$0	$0
Existing	$0	$0	$0	$0	$0
Narrative Explanation/Justification: Not Applicable					
Internal Allocation	$0	$0	$0	$0	$0
Internal Reallocation	$0	$0	$0	$0	$0
Narrative Explanation/Justification: Not applicable					
Student Tuition					
New	$220,130	$484,213	$585,482	$714,744	$828,207
Existing	$0	$0	$0	$0	$0
Narrative Explanation/Justification: It is assumed that students will be enrolled full-time in the fall and spring semesters and for three hours over the summer semesters for two years. The program expects to admit 10 new students in year one, 15 in years two and three, and 20 in years four and five. Assuming a 20% annual attrition rate, enrollment will be 10 in year one, 23 in year two, 27 in year three, 32 in year four and 36 in year five. We have projected an equal split between resident and nonresident students.					
	$220,130	**$484,213**	**$585,482**	**$714,744**	**$828,207**

TOTAL					

B. Breakdown of Budget Expenses/Requirements	1st Year	2nd Year	3rd Year	4th Year	5th Year
Staff					
Executive, Administrative, Managerial					
New	$0	$0	$0	$0	$0
Existing	$0	$0	$0	$0	$0
Other Professional					
New	$0	$0	$0	$0	$0
Existing	$0	$0	$0	$0	$0
Faculty					
New	$0	$0	$0	$0	$0
Existing	$235,481	$642,901	$662,188	$682,054	$702,516
Graduate Assistants					
New	$0	$0	$0	$0	$0
Existing	$0	$0	$0	$0	$0
Student Employees					
New	$0	$0	$0	$0	$0
Existing	$0	$0	$0	$0	$0
Narrative Explanation/Justification: Minimal additional funding will be required to initiate the program. Of the fourteen courses required in the curriculum for the proposed program, eight are courses currently being offered by the university. The six new courses not currently offered will be taught by the program director. Existing faculty will be assigned to teach all coursework for the proposed program: B. Little ($204,000), D. Wu ($113,545), F. Groves ($123,680), J. Barnette ($213,417), J. Gaskins ($104,469), and M. Kong ($113,980). Effort was calculated at 0.15 FTEE for a three-hour course and 0.10 FTEE for a two-hour course. All salary expenses include fringe benefits, which were calculated individually using a PeopleSoft report. These expenses could be considered an internal reallocation, but we did not want to overstate the amount of resources available, especially in light of the inclusion of New Student Tuition, which will be recovered by the university. The only other startup costs are $10,000 per year in Years 1 and 2 for startup marketing expenses and $10,000 per year for the first five years in travel expenses (see below).					
Equipment and Instructional Materials					
New	$0	$0	$0	$0	$0
Existing	$0	$0	$0	$0	$0
Narrative Explanation/Justification: Not applicable.					
Library					
New	$0	$0	$0	$0	$0
Existing	$0	$0	$0	$0	$0
Narrative Explanation/Justification: Not applicable.					
Contractual Services					

B. Breakdown of Budget Expenses/Requirements	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	$0	$0	$0	$0	$0
Existing	$0	$0	$0	$0	$0
Narrative Explanation/Justification: Not applicable.					
Academic and/or Student Services	$0	$0	$0	$0	$0
New	$0	$0	$0	$0	$0
Existing					
Narrative Explanation/Justification: Not applicable.					
Other Support Services					
New	$0	$0	$0	$0	$0
Existing	$0	$0	$0	$0	$0
Narrative Explanation/Justification: Not applicable.					
Faculty Development					
New	$0	$0	$0	$0	$0
Existing	$0	$0	$0	$0	$0
Narrative Explanation/Justification: Not applicable.					
Assessment					
New	$0	$0	$0	$0	$0
Existing	$0	$0	$0	$0	$0
Narrative Explanation/Justification: Not applicable.					
Other					
New	$20,000	$20,000	$10,000	$10,000	$10,000
Existing	$0	$0	$0	$0	$0
Narrative Explanation/Justification: Travel: Funding will be used to support travel by program faculty and staff to professional conferences and marketing events ($10,000 per year). Marketing: Funding will be used to market the new program to prospective students and local healthcare organizations ($10,000 in Y1 and Y2).					
TOTAL					
New	**$0**	**$0**	**$0**	**$0**	**$0**
Existing	**$255,481**	**$662,901**	**$672,188**	**$692,054**	**$712,516**

E. Program Review and Assessment

The following table provides information on items **E. 1a-f**.

Evaluation / Assessment	*Data Collection / Report Development*				*Benchmarks / Targets*
	What?	*Who?*	*How?*	*When?*	
Program Student Learning Outcomes Evaluations	Program SLOs measure results	SPHIS Academic Affairs	Electronic submission from Program	End of each academic year	Program SLO measures and targets
Course Student Learning Outcomes Evaluations	Course SLOs measure results	Program	Electronic submissions from instructors	End of each semester or term	Course SLO measures & targets (under development)

Evaluation / Assessment	*Data Collection / Report Development*				*Benchmarks / Targets*
	What?	*Who?*	*How?*	*When?*	
Student Course Evaluations	Student assessments of courses and instructors	University Office of Academic Planning & Accountability	Electronic surveys	End of each semester or term	Not applicable; used for instructor & course development
Student Program Evaluations	Student assessments of program, advising, and personnel	SPHIS Academic Affairs	Electronic surveys	End of each academic year	Not applicable; used for personnel & Program development
University Academic Program Review	Report on status and performance of Program	Program	Electronic data sub-missions to SPHIS Academic Affairs	Every five years	Determined as Acceptable by Provost's review committee
SACS accreditation	Data and reports requested by Provost's office	Program	Electronic submissio ns to SPHIS Academic Affairs	Every ten years	University & programs reaccredited
CEPH accreditation	Data and reports requested by Dean's office	Program	Electronic submissio ns to Dean's office	Every five years	SPHIS & programs reaccredited

E. 1 (g) Sharing Findings with Faculty: Program SLO results and student program evaluations are shared with all faculty. Course SLO results and student course evaluations are shared with the instructor(s) of a course and the chair(s) of the instructor(s) department(s).

E. 1 (i) Use of data: Every year the Program analyzes the Program SLO results and the student program evaluations to see if revisions to the Program SLOs and/or improvements in the operations of the Program need to be proposed to and discussed with SPHIS Academic Affairs.

E. 2 Measures of Teaching Effectiveness: The measure of teaching effectiveness is the results of course SLO measures compared with targets. At least once a year, these measures are analyzed and discussed by Program faculty to determine if either revisions of the course SLOs and/or of the course design needs to be undertaken.

E. 3 Improving Teaching Effectiveness: Improvement of teaching effectiveness is driven from at least three independent sources: (1) course SLOs, (2) student course evaluations, and (3) exploration and adoption of new pedagogical concepts and techniques by the instructors. Analysis of data from these sources and establishment of specific plans for development of faculty teaching are done by the instructors and their chairs.

SPHIS has an existing teaching and learning initiative in collaboration with the University's Delphi Center for Teaching and Learning. Every year the faculty is surveyed about teaching and learning

topics and their relative rankings. Other efforts include analysis of de-identified data about faculty utilization of Blackboard and its various functions to see what the faculty might be missing or not taking full advantage of. These surveys and analyses are used to plan and schedule monthly Teaching and Learning Workshops for SPHIS faculty. A workshop may feature an outside expert on a topic or an inside enthusiast or expert.

E. 4 Evaluating Students' Post-graduate Success: CEPH accreditation criteria addressing alumni follow-up are:

> *"The school or program collects and analyzes data on graduates' employment or enrollment in further education post-graduation, for each public health degree offered*
>
> *For each degree offered, the school or program collects information on alumni perceptions of their own success in achieving defined competencies and of their ability to apply these competencies in their post-graduation placements."*

SPHIS is currently developing a system to meet these criteria. (See also **B.2** above.)

Appendix 1: CAHIM Accreditation

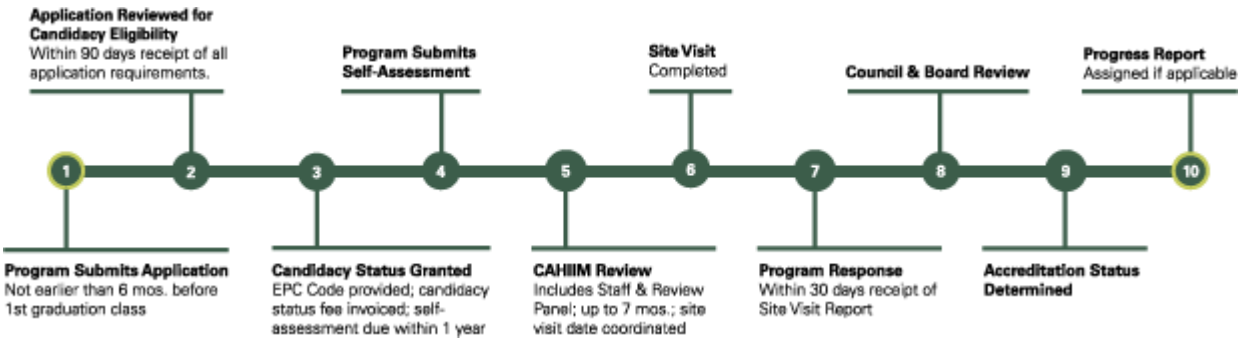
Initial Accreditation

Prior to the application process, a sponsoring institution must develop a program that meets the professional curriculum content and quality of the program as measured by the Health Information Management (HIM) Accreditation Standards. Program administrators must ensure that the program is sustainable per its resource and needs assessment. The program must be developed to ensure stability professionally and financially.

CAS Application Process

CAS (CAHIIM Accreditation System) is the online system for Comprehensive Accreditation Review for Initial Accreditation applicants.

Initial Accreditation Timeline



Conditions for Pre-Application

Timing: Program assesses readiness for application for accreditation. A program must not apply until 6 months before the date of the first graduation class.

The following requirements must be met or completed during this stage in development and when submitting an application:

Program Director: Have hired a permanent Program Director that meets the minimum qualifications in the Standards for a Program Director. The position must be full time throughout the application process.

Full-Time Faculty Member: This individual must report to the qualified Program Director.

Applicant Program Campus: The program and campus applying for accreditation must award the degree which includes online applicant campuses.

Other campus institutional requirements: The sponsoring institution is accredited by a regional or national accrediting institutional agency recognized by the U.S. Department of Education (USDE) to offer a degree or the sponsoring institution is accredited by a national accreditor with USDE provisions in their Grant for Accreditation for establishing eligibility to participate in Title IV programs. Upon request, the applying campus program must

provide the OPEID number assigned by the U.S. Department of Education as proof of participation for financial aid. State Board of Education approvals must also be completed.

Letter of Intent

Programs that meet the minimum requirements for application must submit a Letter of Intent that describes the readiness to pursue Initial Accreditation from the President/chief executive officer. The letter must be submitted 3-6 months in advance of the full application. Submit the letter to CAHIIM staff at info@cahiim.org
Content Description:

- Describe support for the program.
- State reasons for the program's inception or program need.
- Confirm state and institutional authority to provide the degree granting program.
- Indicate the month and year of the program's launch.
- Indicate projected month and year of first graduation class.

Initial Application in the CAHIIM Accreditation System (CAS)

Step one: Registration

If the pre-application conditions have been met the program may initiate this step of completing a Program Profile. All program and institutional information fields must be completed accurately and reflect the program offered.

Step Two: Documents Uploaded in the system

The following files must be completed and submitted. The CAHIIM templates must be used. The CAS Application is submitted in the Actions Tab.

- **Synopsis of Curriculum** – List all required courses in the curriculum (general education and the professional courses) for each specific quarter/trimester/semester within the total curriculum sequence.
  Synopsis of Curriculum
  - Graduate Degree Program
  - Undergraduate Degree Program
- **Curriculum Requirement**s – Complete the Curriculum Requirements template mapping program courses to required curriculum content. ***See website section under specific program level and for more information regarding the 2014 AHIMA Competencies.***
- **Curriculum Vitae for the Program Director** - Current employment must be up to date.
- **Curriculum Vitae for the full time faculty membe**r - Current employment must be up to date.

A program applicant's registration that is not complete and the application documents not submitted will be automatically and permanently deleted within 30 days.

Pre-Application Processing Fee

Once the above stages are completed, the CAHIIM Application Fee must be submitted. $500 payable to CAHIIM. Fee must be received before the assessment process may begin on a submitted application in the system. Contact the Business Manager Benjamin.Reed@cahiim.org if an invoice or credit card payment for this fee is desired.

Appendix 1: CAHIM Accreditation

Staff Review of Application

The application will be reviewed upon receipt of all application requirements. An assessment will be provided within 90 days.

CAHIIM senior staff reserves the right to make final administrative decisions of a program's application status with CAHIIM.

Program Response

A response in the system is required that provides any clarification or request for information.

Outcome and Decision

Denied: An application may be rejected if it does not meet the conditions for application or there are documented issues of non compliance with the Standards at anytime.
Accepted: Accepted into CAHIIM Candidacy Status.

CAHIIM Candidacy Status Description

An application stage while the Candidate program is allowed to complete the Self Assessment information and documentation in the online system.

An applicant program allowed into Candidacy Status is:

- Assigned a CAHIIM Educational Program Code (EPC)
- Assigned a Self Assessment Due Date (1 year from date of when Candidacy Status was achieved)
- Assigned a Candidacy Status expiration date (2 years from date of when Candidacy Status was achieved)
- Sent Invoice for the Candidacy Status Fee

Expiration of Candidacy Status

This status will be terminated if it is found that the Requirements for Candidacy have not been maintained at any time or the maximum 2-year period has elapsed. If the program has been informed of this action, the program must reapply by submitting a new Application for Candidacy.

Candidate Program Submits Self-Assessment

Required Forms for completion and file uploads in this stage:

Program Evaluation Plan (required template for Standard #4. Program Goals)

- Graduate Degree Program Plan
- Undergraduate Degree Program Plan

Budget Template (required template for Standard #22. Financial Support)

Budget Template

Synopsis of Curriculum (required template for Standard #24. The Curriculum)

- Graduate Degree Program
- Undergraduate Degree Program

Curriculum Requirements (required for Standard #24. The Curriculum) Complete the applicable template mapping program courses to required curriculum content.

Appendix 1: CAHIM Accreditation

Online Content Delivery

Academic technologies, software applications and simulations, and online or web-enhanced courses, have a significant role in the learning environment. To fairly evaluate online content the program must provide CAHIIM with full access to all online course content and relevant education applications used to deliver this content.

Program Resources

- Constructing a Useful Syllabus
- CAHIIM Help for Program Users (CAS Instruction Manual)

CAHIIM Review

A formal staff review and assessment of the information submitted. An assessment will be provided within 90 days. A request for clarification or additional information may be requested and is reviewed by CAHIIM quality education staff in the order received.

Site Visit

An onsite visit of the program verifies the accuracy of documentation submitted by the program. The site visit team will meet with program officials to seek conformity with the CAHIIM Accreditation Standards. After the site visit is concluded the site visit team will complete a Site Visit Report stage in the CAHIIM Accreditation System (CAS).

The program is invoiced the Site Visit Processing Fee in this stage.

Download the following documents for this stage:

- Site Visit Checklist
- Site Visit Itinerary Template

Program Response

A formal response to the site visit results is requested from the program director within 30 days.

Council and Board Review

An accreditation recommendation and accreditation decision is provided to the program at the next available meetings. Any program may be awarded a 6 month Progress Report to be submitted if there exists Standard deficiencies that remain that require time for implementation. This information will be required to be completed in the CAHIIM Accreditation System by the CAHIIM specified due date.

Progress Report Requirement

In order to maintain accreditation status the program must submit a progress report that satisfies the remaining Standard deficiencies that resulted from the review process. A The Board Report will reflect the current Not Met or Partial Met Standard deficiencies that require the institution’s attention and provides guidelines for resolution and evidence of implementation in order to achieve full compliance for the program.

Failure to submit this report by the due date may place the program on Administrative Probationary Accreditation. An unsatisfactory progress report or a Substantive Change in Program Director during the progress report process may result in a Focused Review and site visit of the program.

Appendix 1: CAHIM Accreditation

Situations that Adversely Affect the Application Process

Change in Program Director: A change in program director is prohibited during the application process and will lead to removal of Candidate Status and application rejected if the Self Assessment stage has already been submitted in the CAHIIM Accreditation System.

A stable program with no deficiencies may appoint a new permanent program director that is a full time faculty person that meets the qualifications of Program Director in the Standards. The new program director candidate must have been employed and have had involvement in the program for a minimum of 12 months

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Appendix 2: Faculty Roster

Faculty Roster Form
Qualifications of Faculty

1	2	3	4
NAME (F, P)	**COURSES TAUGHT** *(Term, Course Number, Title, Credit Hours (D, UN, UT, G)*	**ACADEMIC DEGREES & COURSEWORK** *(Relevant to Courses Taught, Including Institution & Major)*	**OTHER QUALIFICATIONS & COMMENTS** *(Research Interests)*
Barnette, Jack (P)	PHPH-523 Public Health in the U.S (2 credits) (G) Fall semesters	The Ohio State University, PhD Research, Development, and Evaluation	Properties of metric effect size and strength of association measures including chance values, relationships among effect size and strength of association measures; Psychometric properties of Likert survey structure and data analysis
Gaskins, Jeremy (P)	PHST-661 Probability (3 credits) (G) Fall semesters PHST-662 Mathematical Statistics (3 credits) (G) Spring semesters	University of Florida, PhD Statistics	Longitudinal data, missing data models, covariance/correlation estimation, Bayesian methodology, and Markov chain Monte Carlo methods
Groves, Frank (P)	PHEP-622 Population Pathology (3 credits) (G) Spring semesters	Louisiana State University, M.D. Johns Hopkins University, MPH Epidemiology	Epidemiology, Disease Surveillance, Cancer Epidemiology
Kong, Maiying (P)	PHST-710 Advanced Statistical Computing I (3 credits) (G) Fall semesters	Indiana University-Bloomington, PhD Statistics	Statistical methods on dose-response study, combination drug study, preclinical experimental designs, and longitudinal studies and high-dimensional data analyses
Little, Dr. Bert (F)	PHMS-643 Data Management in Health Service Research (3 credits) (G) Fall semesters PHMS-641 Data Mining I (3 credits) (G) Fall semesters	University of Texas-Austin, PhD Physical Anthropology (Human Genetics, Growth, Adaptability); Applied Mathematics (Statistics, Probability Theory)	Human Genetics/Biology, Applied Mathematics, Health Outcomes, Data Mining/Big Data

Appendix 2: Faculty Roster

1	2	3	4
NAME (F, P)	**COURSES TAUGHT** *(Term, Course Number, Title, Credit Hours (D, UN, UT, G)*	**ACADEMIC DEGREES & COURSEWORK** *(Relevant to Courses Taught, Including Institution & Major)*	**OTHER QUALIFICATIONS & COMMENTS** *(Research Interests)*
	PHMS-XXX Data Security and Electronic Health Records (3 credits) (G) Spring semesters		
	PHMS-642 Data Mining II (3 credits) (G) Spring semesters		
	PHMS-XXX Master's Thesis Research in Health Data Analytics (3 credits) (G) Fall semesters		
	PHMS-XXX Leadership in Health Information Management (3 credits) (G) Fall semesters		
	PHMS-XXX Health Information Management in Public Health (3 credits) (G) Spring semesters		
	PHMS-XXX Health Data Analytics Practicum (3 credits) (G) Summer semesters		
Wu, Dongfeng (P)	PHST-691 Bayesian Inference and Decision (3 credits) (G) Spring semesters	University of California, PhD Statistics	Probability modeling and statistical inferences in periodic cancer screening, Bayesian inference, statistical decision theory, time series, smoothing spline, wavelet regression and all kinds of statistical problems in medical research

.

Appendix 3: Letters of Support and Marketing Materials

UNIVERSITY OF LOUISVILLE
UNIVERSITY LIBRARIES

Office of the Dean

August 24, 2016

Connie Shumake
Office of the Provost
University of Louisville
Louisville, KY 40292

Connie,

We have been asked to provide a letter of support for the Master of Science Degree in Data Analytics. The University of Louisville (UL) Libraries are well positioned to meet the resource demands of this program. Over the years, the Kornhauser Health Sciences Library (KHSL) staff has developed collections of full-text journals and books to support public health Bachelor's and Master's programs forming a core of information resources that will also support this program.

UL Libraries subscribe to approximately 7,100 full-text health sciences or health science-related journals. Over 800 of these journal titles fall under the subject area "Public Health". When titles are counted in areas such as "statistics", "mathematical sciences", "health policy and administration", or included when keywords such as "data", "analytic(s) are used, another 7,000 plus electronic journals are added in support. In excess of 700 public-health related books are available electronically, 121 titles are from the KHSL Oxford Scholarship Online Collection, *Public Health & Epidemiology.* To facilitate accessing the subject content of these electronic resources, UL Libraries host 331 databases, 50 in the health sciences.

All University faculty, students, and researchers may access any electronic resource 24/7 from their home or office. If physically coming to one of the UL libraries is not an option, the Document Delivery Service can electronically send an article or book chapter from a library-owned resource to a requestor's office or home. For resources not held by any of the UL libraries, interlibrary loan (ILL) services are available free-of-charge to any University student, staff, or faculty. The ILL office can borrow almost any item published, from any library in the world, either in the original format, or as a photocopy.

The staff of the UL Libraries also facilitate the understanding and use of the resources. To foster a supportive learning environment, librarians offer extensive reference assistance, helping users to formulate online search strategies, validate citations, and locate materials. By appointment, KHSL librarian liaisons provide in-depth consultation and training sessions for faculty, students, and residents. Classroom instruction is available upon request.

No additional resources or library materials expenditures should be required to support the proposed program. Please contact us if you have any questions or need additional information.

Sincerely,

Robert E. Fox, Jr.
Dean, University Libraries

Cc: Bert Little
Neal Nixon

University of Louisville • Ekstrom Library, Room 203 • Louisville, KY 40292
P: 502.852.6745 **F:** 502.852.7394 **W:** louisville.edu/library

Appendix 3: Letters of Support and Marketing Materials

UNIVERSITY OF
LOUISVILLE.

October 17, 2017

Dear Dr. Farrier and APC Committee members:

The leadership of both the College of Business and the School of Public Health and Information Sciences have explored the potential commonalities between the MS in Health Data Analytics and the new MBA. While we believe these two new degrees target largely different target audiences, we do seem some overlap there and, perhaps more importantly, we see some overlap in a few key instructional areas that might lead to the possibility of sharing or cross listing and/or co-teaching some classes.

We are all extremely excited about the new markets these degrees reflect and feel strongly that both proposals should proceed through the approval process as quickly as possible in order that we might both be operational by fall semester 2018. We hope that both the APC and the Faculty Senate will concur and will advance the proposals quickly.

We do see some opportunities for collaboration and commit our colleagues to a thorough discussion of opportunities. The most obvious area of potential collaboration include the following sets of similar or parallel courses:

College of Business	School of Public Health and Information Sciences
Data Analytics I	Probability
Data Analytics II	Mathematical Statistics
Data Analytics III	Advanced Statistical Computing
Data Management	Data Management in Health Services Research
Data Mining	Data Mining I
	Data Mining II

We will also explore opportunities to share in some marketing efforts and perhaps with capstone projects and faculty supervision.

We strongly feel that these are both excellent new revenue stream programs and that they are both sufficiently different to proceed and that there is ample market out there to support both programs.

Sincerely,

Craig H. Blakely, PhD, MPH
Dean
School of Public Health and Information Sciences

Todd A. Mooradian, PhD
Dean
College of Business

Appendix 3: Letters of Support and Marketing Materials

UNIVERSITY OF LOUISVILLE.

Healthcare Leadership Advisory Board
October 31, 2017

MEMORANDUM FOR RECORD

SUBJECT: Meeting Minutes

1. The semi-annual University of Louisville Healthcare Leadership Advisory Board was conducted on Friday, October 27th, from 2:00 – 4:00 in the Board Room of the University Club on main campus. Meeting notes for each of the main agenda items follow.

2. Overview of new healthcare management programs: An overview (see attached briefing packet) of two proposed new graduate programs, Masters in Science, Health Administration (MSHA) and Masters in Science, Health Data Analytics (MSHDA), was provided to the members to facilitate feedback. Board members reported that they look forward to continuing developments of the program and are ready to provide ongoing advice and counsel regarding new and existing programs. The following points highlight comments from board members:

   MSHA: Introduction of a new CAHME-accredited healthcare management program is essential in the Louisville area to fill a critical developmental need that has not historically been available within the metropolitan area. Members encouraged MSHA curriculum emphasis on healthcare finance and accounting, quality, leadership development, organizational and market transformations, and future health trends. Each of the represented healthcare organizations noted that graduates from this program would support their human capital development needs. Members were interested in the development of both a full-time, resident program and the potential of an executive-based version of the program existing healthcare executives seeking healthcare management graduate education while working.

   MSHDA: Members were particularly enthusiastic about the prospects of new graduate program focused on the analysis of health data to drive more effective and efficient population health decision-making. Several members representing both institutional and nationally-based healthcare management organizations noted that this degree program meets compelling current and future needs for competency development. Members inquired about the prospects of introducing artificial intelligence into the curriculum. Members representing health systems and health consulting organizations strongly advocated for opening admissions to this degree and that their organizations would be eager employers of graduates.

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Appendix 3: Letters of Support and Marketing Materials

3. B.S. OLL-Healthcare Leadership (CBE) Curriculum Updates: An overview of the evolution of the new CBE program curriculum was provided. The program revised the 36-credit hour curriculum from 36 1-credit hour courses (course "families of 3") in "module like" format to 12 3-credit courses. Additionally, the program incorporated four new courses, Healthcare Finance and Accounting, Healthcare Quality Evaluation, Healthcare Information Management, and Healthcare Law and Ethics to further enhance competency development coverage of the National Center for Healthcare Leadership (NCHL) competency model. The new courses will be available for enrollment in Spring 2018.

4. CBE program first year highlights, summary analysis: Highlights of the first year of CBE Healthcare Leadership program operations include 74 admitted students and 38 active enrollments. Admitted and enrolled student counts substantially exceed targeted goals. Program interest and applications remains strong. The program evolved aspects of the program to meet Department of Education Experimental Site requirements for federal financial aid as CBE students seeking federal financial aid must maintain full-time status (24 credit hours in a 32-week academic year period). The program may consider offering an 8-week term (versus CBE non-term) version of the B.S. OLL-Healthcare Leadership program to meet federal financial aid guidelines for part-time students and/or students that seek term-based courses for course completion.

5. First CBE program graduate: Ms. Rachel McClain was introduced as the first graduate (officially in December 2017) of the CBE program. Ms. McClain completed the degree requirements in less than one year (10 months) leveraging the benefits of the CBE non-term, flexible-paced course design and incorporation of the prior-learning assessment course in the curriculum. Ms. McClain enrolled in the program having already earned an associates degree from the Kentucky Community and Technical College System (KCTCS) and serving more than five years in the healthcare field. Ms. McClain will serve as an exemplar and program ambassador to promote enrollment in the program.

6. Success Coach analysis of year student support: Ms. Saundra Kimberlain, CBE Success Coach, provided an overview and analysis of first-year student support and advising trends. Primary points of focus include orientation of returning to higher education adult learners and working with the financial aid office to plan financing of education coordinating multiple potential payer

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Appendix 3: Letters of Support and Marketing Materials

sources including federal financial aid, employer-reimbursement, grants and other awards, and self-pay.

7. Marketing and Promotion Forward: The CBE program reviewed the forward-looking market plan developed in conjunction with the University of Louisville Delphi Center Online Programs Marketing staff. The program will market and promote the CBE bachelor's degree-completion program for healthcare professionals in the Louisville area, across the Kentucky region, and nationally. Special focus for marketing and promotion will be applied with local area healthcare organizations. The marketing and promotion plan provides resources for online and print advertising, direct engagement in state and national conferences, and promotional-informational materials. Analysis of past year marketing and promotional activities indicates that direct engagement on primary (program applicant) and network basis (colleagues, supervisors) coupled with online search resources accounted for the large majority of program leads, applicants, and enrollees.

8. Closing questions, comments. Board members report looking forward to news of having the MSHA and MSHDA programs available for enrollment in 2018. Board members will coordinate with the program for marketing and promotional opportunities onsite for their respective employees.

9. Next meeting: The next Healthcare Leadership Advisory Board meeting will be conducted in Spring 2018 (March or April). A Doodle poll will be conducted to determine whether the meeting will be in person or via teleconference and dates\times.

LEE W. BEWLEY, Ph.D., FACHE
Program Director, Associate Professor

Attachments
Healthcare Leadership Advisory Board Roster
Meeting Briefing Packet

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Healthcare Leadership Program Advisory Board

Alexander-Carney, Victoria	Signature Healthcare
Cornish, Al	Norton Healthcare
Crotty, Art	Tech Solve: Healthcare Solutions
Duncan, Christopher	Army Medical Department (Officer)
Hamilton, Karen	Hosparus
Hanson, Steve	Executive in Residence
Hare, David	Trilogy Health Services
Johnson, Laura	Army Medical Department (Civil Service)
Jones, Fred	Humana
Key, James	Veterans Health Administration
Lorch, Mike	Anthem
Osborne, Vicki	Optum Healthcare
Roty, Chris	CEO, Baptist-Lagrange
Schaefer, Amie	KentuckyOne Health
Souza, Jonas de	Humana
Steele, Jill	Army Medical Department (Senior Enlisted)
Vancampen, Kathy	Clark Memorial Hospital
Walton, Tom	Executive in Residence

Appendix 4: Example of Syllabus

Course Data

Number: PHMS-641
Title: Data Mining I
Credit-hours: 3
Department: Health Management and Systems Sciences
School/College: School of Public Health and Information Sciences
Type: Lecture

Catalog Description

The course is first in a two semester sequence graduate level introduction to data mining/ big data analytics. It focuses on practical implementation and interpretation of the most commonly used techniques in analysis of very large datasets.

Course Description

This first course will train students with the necessary skills for data mining/big data analytics in graduate studies and will be used in employment after graduation. The first course in the two course sequence covers the collection of techniques used in practice to analyze huge datasets. The course focuses on building essential abilities: (1) formulating an approach to the problem, (2) application of the technique, (3) interpretation of results, and (4) presentation of results: oral and written communication. The course is designed to spend approximately one week on each analytical technique: mathematical and computation considerations, software available to perform the analytics, and the practical interpretation of the results in an evidence-based production environment.

The analytical skills presented in this course are directly applicable to real world problems. The demonstration of practical application of the techniques will culminate in an analytics project by each student will be presented at the end of the semester.

Course Objectives

By the end of the course, students should be able to:

- Assess a large analytics project and choose appropriate analytic technique(s).
- Apply appropriate analytic technique(s) to large datasets to solve real world problem(s).
- Prepare results for professional presentation
    - Problem statement
    - Method of approach and rationale
    - Results in narrative, tabular, and graphic form
    - Interpretation of results for application to solve real world problem
    - Supporting documentation

Prerequisites

Enrollment in the Health Management specialization of the Public Health Services PhD program or have completed Multivariate Analysis (PHST 682) **or** Linear Algebra (Math 325).

Course Instructors

Name	*Office*	*Phone*	*Email*	*Office Hours*
Bert Little, PhD	SPHIS 105	502-852-5933	Bert.Little@louisville.edu	10-12 M-F

Appendix 4: Example of Syllabus

The course instructor welcomes conversations with students outside of class. Students may correspond with an instructor by email or set up appointments by contacting Professor Johnson at 502-852-5933 or Bert.Little@louisville.edu.
Students should also contact Professor Little with questions they might have regarding the mechanics or operation of the course.

Course Topics and Schedule

IMPORTANT NOTE: The schedule and topics may change as the course unfolds. Changes are posted and announced on Blackboard (Bb).

Class Schedule		
Class	***Date***	***Topic(s)***
1		Data Mining – Mathematical, Statistical, and Algorithmic Foundations
2		Matrix algebra and multivariate analysis – connections and equivalencies
3		Matrix functions – Add, subtract, multiply, invert
4		Multiple Regression and Derivatives
5		ANOVA/MANCOVA
6		Principal Components Analysis/ Factor Analysis
7		Discriminant Analysis
8		Decision Trees and Decision Rules
9		CART (Classification analysis and regression trees)
10		Cluster Analysis
11		Deviation Detection
12		Logistic Regression
13		Rare Events Analysis: Gumbel, Weibull, and Frechet
14		Student Project presentations

Course Materials

Blackboard

The primary mechanism for communication in this course, other than class meetings, is UofL's Blackboard system at http://ulink.louisville.edu/ or http://blackboard.louisville.edu/. Instructors use Blackboard to make assignments, provide materials, communicate changes or additions to the course materials or course schedule, and to communicate with students other aspects of the course. It is imperative that students familiarize themselves with Blackboard, check Blackboard frequently for possible announcements, and make sure that their e-mail account in Blackboard is correct, active, and checked frequently.

Appendix 4: Example of Syllabus

Required Texts

Anderson A. *Statistics for Big Data for Dummies.* John Wiley: NYC, 2015.

Marconi K, Lehmann HP. Big Data and Healthcare Analytics. Apple Academics Press: Oakville, CA, 2014.

Other Required Reading

None.

Additional Suggested Reading

None.

Prepared Materials Used by Instructors

Materials used by instructors in class are available to students via Blackboard no later than 24 hours following the class. These may include outlines, citations, slide presentations, and other materials. There is no assurance that the materials include everything discussed in the class.

Course Policies

Attendance and Class Participation

All assigned readings are to be completed before class meetings to provide rich discussion. All articles will be made accessible via the course Blackboard site.

Student Evaluation

1. **Class Practicum Analytics (20%) – Each student is required to do an analytics problem set each week. Lowest two scores will be dropped, and the ten remaining scores will be used in a non-weighted average to determine the student's score for class practicum analytics.**
2. **Mid-Term and Final Examinations (30%)** – A cumulative and comprehensive mid-term and final examination will be given. The examination will be open book, problem-based.
3. **Class Attendance and Participation (20%)** – There will be reflection questions for each class posted on Blackboard that students should be prepared to respond to for every class session. These will be discussed during class and the quality of responses to these questions will be assessed. Students who are unable to attend class must submit written answers for the topics covered during the student's absence in order to receive credit for class participation during the day(s) the student is (are) absent.
4. **Class Project (30%)** – Each student will select a healthcare database at the beginning of the semester. The student will identify from the published literature a real world research question of current interest that the database may be used to answer. The student will analyze this database during the semester. The student will write a final paper on the analysis of the database and deliver an oral presentation to the class on the project. More information about this project will be discussed in class.

Grading

The components of student evaluation are weighted as follows:

1.	**Class Practicum Analytics**	20%
2.	**Mid-Term and Final Examinations**	30%
3.	**Class Attendance and Participation**	20%
4.	**Class Project**	30%

Appendix 4: Example of Syllabus

Final Grade	***Final Points***	***Final Grade***	***Final Points***
A+	[97, 100+]	C	[73, 77)
A	[90, 96)	C-	[70, 73)
B+	[87, 90)	D+	[67, 70)
B	[83, 87)	D	[63, 67)
B-	[80, 83)	D-	[60, 63)
C+	[77, 80)	F	[0, 60)

Grading is *Notes:*

1. *Interval notation is used in table to the left:*

"[" indicates greater than or equal to the subsequent value

"(" indicates greater than the subsequent value

"]" indicates less than or equal to the preceding value

")" indicates greater than the preceding value

For example, [93, 97) *indicates "93 up to but not including 97" or equivalently "greater than or equal to 93 and less than 97."*

2. *There is no A- for this course, though grading is based on* ABCF+/- *basis*.

Grade Item		A	B	C	F
Class Practicum Analysis Work	Criterion	Outstanding: Well-conceived and written-up analysis, and analytic solution(s) follow directly from the assignment	Satisfactory: Acceptable approach to the problem, and solutions include most of the expectation from assignment	Unsatisfactory: Poorly written, did not follow an acceptable analytical approach to the problem, did not provide answers that come from the assignments and analytics are not correctly applied	Failure: Did not turn in assignment on time, did not follow assignment instructions, and analytics are not correctly applied to answer the question(s)
	Score	20-19	18-16	15-14	14-0

Appendix 4: Example of Syllabus

Grade Item		A	B	C	F
Mid-Term and Final Exams	Criterion	Outstanding: Well written, answers are: 1. Professional, 2. Directly related to question/ problem, and 3. Interpretation of the answers is correct.	Satisfactory: Mostly well written answers: 1. Professional with no major exceptions, 2. Analytics are not completely related to question/ problem, and 3. Interpretation of the answers is not entirely correct.	Unsatisfactory: Answers are poorly written, 1. Not professional, 2. Analytics are not correct, and 3. Interpretation of analytics is not correct. Answers not satisfactory, and contain major flaws	Failure: Did not answer analytics questions correctly or professionally. All questions were answered poorly, and display no knowledge of analytics instructions, poorly written with major flaws
	Score	30 -27	26-23	22-19	18-0
Class Participation	Criterion	Demonstrates outstanding preparation for seminars, asks advanced questions, and readily integrates new knowledge and information	Demonstrates satisfactory preparation for seminars	Is poorly prepared for seminars, has not read materials, and brings no new information	Consistently does not attend class and when attending does not participate in the discussion in any meaningful way.
	Score	20-19	18-16	15-14	14-0
Class Project	Criterion	Outstanding: Paper is very well written, follows a logical analytics flow, and answers a real world problem using data analytics. Oral presentation was flawless. Quality is paramount.	Satisfactory: Well written, generally the paper follows a logical analytics flow, most of the analytics are applied correctly, and interpretation is generally appropriate. Oral presentation was very good, few errors.	Unsatisfactory: Poorly written, did not follow a logical analytics flow, did not answer address the majority of the analytics correctly. Mediocre oral presentation with numerous flaws.	Failure: Did not turn in assignment on time, did not follow assignment instructions, very poorly written with many grammatical errors. Oral presentation was more erroneous than correct, not coherent, not acceptable work at the graduate level.
	Score	30 -27	26-23	22-19	18-0

Appendix 4: Example of Syllabus

Student Responsibilities

- Students are responsible for their own learning. Instructors can only provide opportunities to learn.
- Students read the required materials prior to each class to prepare for class work and discussions.
- A learner participates by attending every class possible and by taking responsibility for course material when attendance is impossible.
- Participation includes being actively engaged in class discussions, assignments, and activities.
- Students are contributing members of their teams. The teams support their members.
- A student checks email and Blackboard regularly for homework assignments and other course-related communications.
- A student completes assignments by the due dates that are communicated in class and posted on Blackboard. Late assignments are accepted with a penalty of 5% of the points for the assignment for each day or part thereof late.
- A participant acts with integrity, including students, guests, and instructors.
- Students abide by the policy for academic honesty (below under Other Policies). Examples of violations of academic honesty are plagiarism, authoring another student's assignment, having another person author your assignment, and fabrication of reasons for tardy submission of assignments.
- Classes start at the time scheduled, so a student is on time to avoid class disruption. If the instructor is delayed past the start of class, he or she makes best effort to notify students of both the delay and estimated class start time. A student waits in class for at least 15 minutes after the instructor's estimated start time or scheduled start if no notice is given.
- In all course activities, students apply the intellectual standards, especially clarity, accuracy, relevance, significance, completeness, and logic.
- Students apply the information and guidance in The Mini-Guide in class discussions and components of student evaluation (see next section).
- Students are responsible for and may be evaluated on anything in the assigned reading, anything in class presentations and discussions, and anything that can be extracted or extended from these sources using critical thinking and fundamental and powerful concepts.

Excused Absences and Make-Ups

In the following four paragraphs, an "approved source" refers to a person who is engaged in a service connected with the reason for the student's absence and is qualified to provide official documentation for the reason for the student's absence. Examples of approved sources are, without limitation, physicians, nurse practitioners, licensed therapists, licensed funeral directors, university athletic directors and designees, and university administration.

A student is excused from the graded activity of a class analyses provided he or she presents written documentation from an approved source that provides a valid reason for the student to have been unable to perform or be present for the graded activity. The documentation must cover the timeframe for the activity: for a class analysis, the class in which it was staged. No make-up is available for this activity but the student's score for each instance is not affected by his or her excused absence.

A student is allowed to make up the graded activity of the syllabus quiz provided he or she presents written documentation from an approved source that provides a valid reason for the student to have been unable to complete the graded activity was staged. If the absence is not due to illness, sudden emergency, or other unexpected event, the student is expected to present the documentation in time to arrange for a make-up prior to the graded activity's scheduled occurrence.

A student is excused from team-based graded activities, such as scenario analyses and/or HP2020 presentations, provided he or she presents written documentation from an approved source that provides a valid reason for the student to have been unable to perform or be present for the graded activity.

A student is not penalized for late submissions of the graded activity of the final reflection piece or final scenario analysis provided he or she presents written documentation from an approved source that provides a valid reason for the student to have been unable to perform and submit the graded activity on time.

Appendix 4: Example of Syllabus

Other Policies

Expected Student Effort Out of Class
Students are expected to spend an average at least 2-1/2 hours per week per credit hour on the course exclusive of class time. This time includes but is not limited to reading, research, preparations for class, team or group meetings (electronic or otherwise), and course deliverables.

Syllabus Revision
The course director reserves the right to modify any portion of this syllabus. A best effort is made to provide an opportunity for students to comment on a proposed change before the change takes place.

Inclement Weather
This course adheres to the University's policy and decisions regarding cancellation or delayed class schedules. Adjustments are made to the class schedule as necessary to take into account any delays or cancellations of this class. Local television and radio stations broadcast University delays or closings. The UofL web site (www.louisville.edu) and telephone information line (502-852-5555) also broadcast delays or closings.

Grievances
A student who has grievances regarding the course should seek to have the matter resolved through informal discussion and through administrative channels, such as the course director, chair of the course's department, associate dean for student affairs, and university grievance officer. If the issue remains unresolved, the student may file a formal grievance. More information is located at Summary of SPHIS Student Academic Grievance Procedure in Student Academic Grievance Committee (https://sharepoint.louisville.edu/sites/sphis/cbg/sagc/default.aspx).

Disabilities
In accordance with the Americans with Disabilities Act, students with bona fide disabilities are afforded reasonable accommodation. The Disability Resource Center certifies a disability and advises faculty members of reasonable accommodations. More information is located at http://louisville.edu/disability.

Academic Honesty
Students are required to comply with the academic honesty policies of the university and School of Public Health and Information Sciences. These policies prohibit plagiarism, cheating, and other violations of academic honesty. More information is located at https://sharepoint.louisville.edu/sites/sphis/policies.
Course instructors use a range of strategies (including plagiarism-prevention software provided by the university) to compare student works with private and public information resources in order to identify possible plagiarism and academic dishonesty. Comparisons of student works require students to submit electronic copies of their final works to the plagiarism-prevention service. The service delivers the works to instructors along with originality reports detailing the presence or lack of possible problems. The service retains copies of final works and may request students' permission to share copies with other universities for the sole and limited purpose of plagiarism prevention and detection.
In addition instructors provide the opportunity for students to submit preliminary drafts of their works to the service to receive reports of possible problems. Such reports are available only to the submitting student. Copies of preliminary drafts are not retained by the service.

Title IX/Clery Act Notification

Appendix 4: Example of Syllabus

Sexual misconduct (including sexual harassment, sexual assault, and any other nonconsensual behavior of a sexual nature) and sex discrimination violate University policies. Students experiencing such behavior may obtain **confidential** support from the PEACC Program (852-2663), Counseling Center (852-6585), and Campus Health Services (852-6479). To report sexual misconduct or sex discrimination, contact the Dean of Students (852-5787) or University of Louisville Police (852-6111).

Disclosure to University faculty or instructors of sexual misconduct, domestic violence, dating violence, or sex discrimination occurring on campus, in a University-sponsored program, or involving a campus visitor or University student or employee (whether current or former) **is not confidential** under Title IX. Faculty and instructors must forward such reports, including names and circumstances, to the University's Title IX officer.

For more information, see the Sexual Misconduct Resource Guide.

Continuity of Instruction Plan
A plan for continuity of instruction for this course has been developed and published. All plans are available at https://sharepoint.louisville.edu/sites/sphis/do/aa/coip. Continuity of instruction plans provide guidance for how instruction may be modified to lessen disruption by events that affect transportation, communication, or personal interaction. Such events may be weather-related (e.g., floods, blizzards, tornados), health-related (e.g., epidemics), or other widespread occurrences or threats.

Additional Policy Information
Additional policy information is available in the following:

- SPHIS Catalog (https://sharepoint.louisville.edu/sites/sphis/do/aa/catalog/eCatlib/Current%20eCatalog.aspx)
- SPHIS Policies and Procedures (https://sharepoint.louisville.edu/sites/sphis/ppgf)
- UofL Graduate Catalog (http://louisville.edu/graduatecatalog)

v2016.04.21-01

Appendix 4: Example of Syllabus

Version	2016.04.21-01

Course History				
Version	***Submitted***	***Approved***	***Change Summary***	***Author(s)***
2016.04.21	4/21/2016	5/9/2016	• Initial version • Approved by AA/CC 4/27/16 • Approved by SPHIS Faculty Forum 4/28/16 • Approved by Provost's Office 5/9/2016	Bert Little, PhD
2016.04.21-01	1/24/2017	2/1/2017	• Changed prerequisites to allow enrollment for HMSS PhD students.	Darla Samuelsen

Appendix 5: Career Examples for a Master's of Science in Health Data Analytics

Career Category	Possible Job Titles
• Hospitals • Medical Centers • Research Institutions • Startups • Government Health Agencies • Global Health Organizations	• Clinical Data Analyst • Director of Clinical Informatics Research • Statistical Analyst • Senior Programmer Analyst • Advanced Research or Clinical training • Clinical Manager • Data Architect • Clinical Information Manager • Medical Director • Software Development Engineer • Program Director • Clinical Instructor • Director of Billing • Compliance Quality Specialist • Chief Medical Officer • Clinical Informatics Officer • Data Analyst • Health Informatics Director

*(**Source:** <http://universitycollege.du.edu/hc/degree/masters/health-data-informatics-and-analytics-online/degreeid/526#careers>).*

Master of Science in Data Analytics, HMSS

	Year 1	Year 2	Year 3	Year 4	Year 5
Projected Admissions	10	15	15	20	20
Projected Enrollment	10	23	27	32	36
UofL Tuition Recovery	$220,130	$484,213	$585,482	$714,744	$828,207
SPHIS Tuition Recovery	$0	$0	$0	$0	$0
Fees	$0	$0	$0	$0	$0
Partner Contributions	$0	$0	$0	$0	$0
Total Revenue	$220,130	$484,213	$585,482	$714,744	$828,207
Faculty Salaries (3% escalation)	$193,634	$528,593	$544,451	$560,785	$577,608
Faculty Fringe	$41,847	$114,308	$117,737	$121,269	$124,907
Marketing	$10,000	$10,000	$0	$0	$0
Travel	$10,000	$10,000	$10,000	$10,000	$10,000
Total Expenses	$255,481	$662,901	$672,188	$692,054	$712,516
Annual Surplus (Deficit)	-$35,351	-$178,688	-$86,707	$22,690	$115,691
Rolling Surplus (Deficit)	-$35,351	-$214,040	-$300,747	-$278,057	-$162,365
UofL Tuition (3% escalation)					
full-time resident	$6,123	$6,307	$6,496	$6,691	$6,892
hourly resident	$681	$701	$722	$744	$766
full-time nonresident	$12,743	$13,125	$13,519	$13,925	$14,343
hourly nonresident	$1,417	$1,460	$1,504	$1,549	$1,595