

**Collaborative International Dual Master of Science (MS) degree Program in Biostatistics
To Be Offered by Indiana University in Indianapolis
and Shanghai Jiao Tong University (SJTU) in China**

Date Submitted: 5/7/15

1. Characteristics of the Program

- a. Campus(es) Offering Program: Indiana University-Purdue University Indianapolis
- b. Scope of Delivery: This program will be offered at IUPUI and SJTU in China.
- c. Mode of Delivery: Classroom and online (one course on the IUPUI campus)
- d. Other Delivery Aspects: Students enrolled in the collaborative international dual MS degree program in Biostatistics will take classes at SJTU and IUPUI.
- e. Academic Unit(s) Offering Program: Indiana University Richard M. Fairbanks School of Public Health (FSPH) Department of Biostatistics and Shanghai Jiao Tong University Department of Mathematics
- f. Anticipated starting semester: Fall of 2016

2. Rationale for the Program

- a. Institutional Rationale

Innovation in graduate education through international collaborations is a priority of Indiana University. As noted in the Bicentennial Strategic Plan for Indiana University approved on 12-5-14, the international dimension of excellence includes increasing IU's engagement internationally through expanded strategic partnerships with leading institutions of higher education throughout the world. Shanghai Jiao Tong University is one of the oldest, most prestigious and selective universities in China. The IU strategic plan describes partnership agreements with foreign institutions of higher education as fundamental to international collaboration in research and scholarship. The plan calls for Indiana University to be both entrepreneurial and collaborative in pursuing its vision and generating the resources to accomplish it. The IU Richard M. Fairbanks School of Public Health is interested in expanding its international partnerships and programs to generate funding to support graduate education in Biostatistics and promote the school's long-term strategic plan of gaining an international reputation. (See Dean's strategic plan for internationalization of IU Fairbanks School of Public Health in the supplementary materials)

The proposed collaborative international dual MS degree program in Biostatistics between IU and SJTU builds an innovative model for globalization in IU graduate education and bridges

educational cooperation between IU and an internationally well-known university in China. This program has received enthusiastic support from the IU Office of International Affairs and will have a profound impact on the IU Department of Biostatistics, the Richard M. Fairbanks School of Public Health, and the IU community in the following areas:

- a. With the special design of this collaborative program, it will attract high-achieving students from this top Chinese university into our newly established MS program to make it competitive to other well-established programs in peer institutions. Additionally, it will enhance the reputation of the IU Department of Biostatistics at an international level. This is of critical importance for the success of the new, promising, graduate program.
- b. The program has the potential to generate significant revenue through international student tuition, and thus is of critical importance for the long-term viability of the graduate program in the FSPH Department of Biostatistics. If successfully implemented, it is likely to help generate funding for faculty research and Ph.D student support, thus providing a vital resource for the Department and the School to grow when facing the national challenge of shrinking research funding.
- c. The success of this program will help promote the collaborative relationship between IU and SJTU at the university level and could lead to other collaborations in education and research. It is also of importance in enhancing the global visibility of the Department of Biostatistics, FSPH and Indiana University.

The MS in Biostatistics addresses state priorities reflected in Reaching Higher, Achieving More in the following ways. (1) First, the program recognizes the changing needs of students in this discipline. Students applying for jobs in Biostatistics will be marketable in the US and in China. (2) Second, the MS degree draws upon the distinct role that the IU Department of Biostatistics faculty have in meeting the educational need in this discipline. As Indiana's only academic department shared by the IU School of Medicine and Fairbanks School of Public Health, the IU Department of Biostatistics is uniquely poised to meet this need. (3) Third, the MS in Biostatistics was specifically designed based on the knowledge and skills that are needed by professionals in this discipline.

b. Evidence of Labor Market Need

In addition to the national or global positive jobs outlook for statisticians and biostatisticians, it should be noted that this type of collaborative master's degree in Biostatistics is lacking in the region. Biostatisticians can fill positions traditionally within the purview of statisticians and health economists or, in some cases, actuaries and insurance specialists, where their understanding of the biological or health aspect of the field will prove advantageous.

Universities in the United States are moving aggressively to secure their place in the higher education market in China, where a surging private-sector economy and growing middle class are fueling a demand for Western style education. Among the most sought-out disciplines is

Biostatistics, which typically confers a well-paid job in the local pharmaceutical industry. This demand is fueled by the branching out of major pharmaceutical companies to China, particularly in Shanghai, the center of the pharmaceutical industry in East Asia and the Pacific region. Yet few Chinese universities have the capacity to meet this market demand. Many of the better known Statistics and Biostatistics programs in the US such as at Columbia University, George Washington University, University of Buffalo, University of Missouri, etc. have recognized this opportunity and are actively establishing a foothold in China.

The Department of Biostatistics at the newly established Indiana University Fairbanks School of Public Health (FSPH) has the full spectrum of graduate education in Biostatistics offering MPH, MS and Ph.D degrees. The MS degree in Biostatistics was approved by the Indiana Commission for Higher Education in February of 2014 and is anticipated to generate interest among domestic students in Biostatistics, especially those in Indiana, since it is the only such program in the state. The department has a strong faculty to develop a solid graduate training program to compete with peer institutions in the education market at a global level.

Dr. Ying Zhang, Professor and Director of Education in the Department of Biostatistics in the FSPH, visited the Department of Mathematics at Shanghai Jiao Tong University (SJTU) multiple times in the past few years as a visiting scholar. During these visits, SJTU expressed a strong desire for international collaboration in graduate education in applied statistics between IU and SJTU. Faculty in the FSPH discussed with the school's leadership as well as the Associate Dean of the Graduate Office at IUPUI the idea of offering a collaborative program. Dr. Barry Katz, IU Biostatistics Department Chair, and Dr. Paul Halverson, Dean of FSPH, have both expressed great enthusiasm for this collaboration.

As a result of the established partnership with SJTU, one of the premier research universities in China, the IU Biostatistics Department reached out to SJTU to explore the possibility of establishing a two-year collaborative international dual MS degree program. This two-year program will create a pathway for SJTU students to advance their training in statistical methodology and data analytics at IU. Students meeting the IU admission criteria will take mathematical statistics oriented courses at SJTU in the first year and will come to IU in the second year to complete the biostatistics oriented courses to meet the degree requirements at IU. The program will prepare students for employment in the health science professions and pharmaceutical industry in China.

The SJTU was selected as a partner because of its excellent academic reputation, solid faculty research strength, and outstanding student quality. The SJTU is one of the most prestigious universities (with national college ranking at the 4th or 5th position consistently) in China and has many strong researchers. It has an excellent reputation in China for collaborating with major research institutions around the world. The SJTU Department of Mathematics currently has collaborative degree programs in Mathematics with four other universities (Northwestern University, University of Wisconsin at Madison, University of Konstanz, Germany and Pierre and Marie Curie University, France).

The SJTU has the reputation in China for high academic standards, especially in science and engineering education. The statistics faculty in the SJTU Department of Mathematics has many world-class, highly accomplished researchers in the areas of mathematical statistics and statistical applications in finance. Although its biostatistics curriculum is not as comprehensive as that offered by IU's MS program in Biostatistics, its mathematical statistics curriculum is beyond what is normally required for the MS in Biostatistics (see the next section). The MS degree in Biostatistics in the FSPH requires a total of 42 credit hours in which 18 hours (from both required and elective courses) can be distributed toward mathematical statistics oriented courses. Hence the amount of credit hours transferred from SJTU will not undermine the quality of the MS degree in Biostatistics at the FSPH.

Students admitted to the SJTU graduate school are highly competitive and have received excellent training in mathematics and other quantitative methods that are fundamental to graduate study in Biostatistics. The students recruited by both the statistics and applied statistics programs at SJTU will be eligible for admission to the IU MS program in Biostatistics only if they meet the FSPH admission criteria, including English proficiency demonstrated by the TOEFL test, minimum GPA of 3.0, and all other requirements for regular admission to the program. The students of this program are expected to be more academically competitive than most of MS applicants that we recruit through a normal admissions process and will also be competitive students for the FSPH Ph.D. program in Biostatistics after completion of the MS degree. Since they will already be admitted to the SJTU master's program before applying to IU, the GRE will not be required as an extra incentive for them to apply to the IU MS degree in Biostatistics.

i. Preparation for Graduate Programs or Other Benefits

Biostatistics is the application of statistical methods to a wide range of topics in biology and medicine as well as the collection, management and interpretation of data from these fields. It is a key discipline in the expanding biomedical research and teaching agenda of the University as well as translational research across academic institutions in the Nation and the world. The availability of this degree will thus enhance the competitiveness of the Indiana University School of Public Health as a teaching and research institution within the State of Indiana, nationally and internationally. The MS will prepare students for a doctoral program in biostatistics.

ii. Summary of Indiana DWD and/or U.S. Department of Labor Data

The Occupational Outlook Handbook, 2010-2011 edition, issued by the Bureau of Labor Statistics, states that individuals working in statistics-related areas find work in a variety of fields, in government, academia and the private sector. The Handbook explicitly states that, in this area, "A master's degree ... is the minimum educational requirement for most jobs." An overall growth of 13% is projected between 2008 and 2018, and that "[among those graduates] with a strong background in an allied field, such as finance, biology, engineering, or computer science, should have the best prospects of finding jobs related to their field of study." A

number of articles and blogs, by the New York Times , the Head of the Office of Management and Budget and Google have recently anticipated a major increase in employment of statisticians. High profile competitions, like the recently completed \$1 million Netflix contest to improve the company's movie recommendation system, requiring modern statistical theory, have also raised the profile of the profession. Overall, there is a confluence of factors, which will undoubtedly lead to an increased demand for statisticians over the coming decade.

Employment opportunities exist in healthcare-related areas in both the public (governmental) and private (business/industry). The continued growth of the pharmaceutical field is likely to generate an increased demand for biostatisticians, according to the Bureau of Labor Statistics.

The BLS reports that job opportunities for biostatisticians will grow by 13% between 2008 and 2018. As of June 2011, Salary.com indicated that the median salary for biostatisticians was \$74,433. Salaries in the 25th-75th percentile range were \$61,996-\$80,330 respectively.

iii. National, State, or Regional Studies

Universities in the United States are moving aggressively to secure their place in the higher education market in China, where a surging private-sector economy and growing middle class are fueling a demand for Western style education. Among the most sought-out disciplines is Biostatistics, which typically confers a well-paid job in the local pharmaceutical industry. This demand is fueled by the branching out of major pharmaceutical companies to China, particularly in Shanghai, the center of the pharmaceutical industry in East Asia and the Pacific region. Yet few Chinese universities have the capacity to meet this market demand. Many of the better known Statistics and Biostatistics programs in the US such as at Columbia University, George Washington University, University of Buffalo, University of Missouri, etc. have recognized this opportunity and are actively establishing a foothold in China. In addition to the national or global positive jobs outlook for statisticians and biostatisticians, a collaborative dual MS degree in Biostatistics is not available in China.

iv. Letters of Support

The proposed dual degree MS program received enormous support from the Dean of IU Fairbanks School of Public Health, Prof. Paul Halverson, the Chair of IU Department of Biostatistics, Prof. Barry Katz, the Director of the IUPUI Office of International Affairs, Ms. Jan Aycock, and the Deputy Chair of SJTU Department of Mathematics, Prof. Dong Hang. (See the letters of support in the supplementary materials)

3. Cost of and Support for the Program

The Office of University Regional Affairs, Planning, and Policy will provide assistance on presenting needed resources and sources of funding when it reviews the draft proposal.

a. Costs

i. Faculty and Staff

All faculty and staff needed to offer this program are currently in place now. No new faculty or staff will need to be added. *See Appendices: **Faculty and Staff** for additional detail.*

ii. Facilities

Offering this program will have no impact on existing facilities, and no new facilities or space will be required.

iii. Other Capital Costs (e.g. Equipment)

There is no institutional financial support required for this collaborative program. Existing infrastructure and resources will support the program, thus there is virtually no financial risk to IU to implement this program.

b. Support

i. Nature of Support (New, Existing, or Reallocated)

The MS in Biostatistics is an existing graduate program at IUPUI. The infrastructure to support the program and its students is already in place. There is no institutional financial support required for this collaborative program.

ii. Special Fees above Baseline Tuition

N/A

4. Similar and Related Programs

a. List of Programs and Degrees Conferred

i. Similar Programs at Other Institutions

There are no campuses at IU or throughout the state that offer collaborative dual degree programs similar to this one. In Indiana, the MS in Biostatistics is offered only at IUPUI. Offering this program will increase the number of students who enroll in the MS in Biostatistics.

ii. Related Programs at the Proposing Institution

N/A

b. List of Similar Programs Outside Indiana

The SJTU Department of Mathematics currently has collaborative degree programs in Mathematics with four other universities (Northwestern University, University of Wisconsin at Madison, University of Konstanz, Germany and Pierre and Marie Curie University, France).

c. Collaboration with Similar or Related Programs on Other Campuses

The FSPH has existing dual degree programs that include the MD-MPH, JD-MPH, JD-MHA, MSW-MPH, MBA-MHA, MHA-MPH and MA-MPH, however, there are no similar or related graduate-level dual degree programs that include an international collaboration. The SJTU in China was selected as a collaborative partner for this degree because of its excellent academic reputation, solid faculty research strength, and outstanding student quality. The SJTU is one of the most prestigious universities in China and has many strong researchers. It has an excellent reputation in China for collaborating with major research institutions around the world.

5. Quality and Other Aspects of the Program

a. Credit Hours Required/Time To Completion

Students who wish to enroll this program are expected to complete a total of at least **50 credit hours** from the curriculums in both institutes (See Table 1 for the study plans in the Appendix). The students will complete the first year of their graduate study at SJTU, taking mathematical statistics oriented courses that are equivalent or comparable to our MS required and elective courses (see detailed explanation in next section). The academic standards and grading structures are very similar for the two universities (see Table 2 in the Appendix).

The following is the current curriculum of IU MS degree in Biostatistics:

1. Required core courses: (24 credit hours)

- a. Introduction to Probability, Stat 519 (3 hours)
- b. Mathematical Statistics I, Stat 528 (3 hours)
- c. Biost. Method I with one hour Lab session-Linear Regression, PBHL B641 (BXXX for Lab) (4 hours)
- d. Biost. Method II with one hour Lab session-Categorical Data Analysis, PBHL BXXX (BXXX for Lab) (4 hours)

- e. Biost. Method III with one hour Lab session-Survival Data Analysis, PBHL B642 (BXXX for Lab) (4 hours)
 - f. Biost. Method IV-Longitudinal Data Analysis, Bios S546 (to be changed to PBHL BXXX) (3 hours)
 - g. Biost. Computing, PBHL BXXX (3 hours)
- 2. Required Public Health Course: (3 hours)**
- a. Introduction to Public Health, PBHL XXX
- 3. Required Epidemiology course: (3 hours)**
- a. Fundamental Epidemiology, PBHL E 517
- 4. Elective Courses: (Up to 12 credit hours)**
- a. Any relevant courses upon departmental approval

The first-year curriculums of SJTU MS programs in both the Statistics and Applied Statistics are listed as follows:

1. Required Courses

a. MS in Statistics

- Dialect of Nature (1 hour)
- English (3 hours)
- Scientific English (1 hour)
- The Theory and Practice of Socialism in China (2 hours)
- Measure Theory and Probability (3 hours)
- Advanced Mathematical Statistics (4 hours)
- Linear Models and Regression (3 hours)
- Stochastic Processes (4 hours)
- Survival Analysis (3 hours)
- Multivariate Statistics Analysis (3 hours)
- Nonparametric Statistics (3 hours)
- Seminar (2 hours)

b. MS in Applied Statistics

- Dialect of Nature (1 hour)
- English (3 hours)
- Scientific English (1 hour)
- The Theory and Practice of Socialism in China (2 hours)
- Linear Models and Regression (3 hours)
- Statistical Inference and Decision (3 hours)

- Applied Stochastic Process (3 hours)
- Statistical Software (3 hours)
- Applied Time Series Analysis (3 hours)
- Seminar (2 hours)

2. Elective Courses

a. MS in Statistics

- Bayesian Statistics (2 hours)
- Statistical Learning (3 hours)
- Complex Networks (3 hours)
- Time Series Analysis (3 hours)
- Survey Sampling (2 hours)
- Experimental Design (2 hours)
- Advanced Computing Methods (3 hours)
- Stochastic Analysis (3 hours)
- Mathematical Finance (3 hours)
- Limit Theorems of Probability Theory (2 hours)
- Statistical Methods in Quality Management (2 hours)
- Statistics in Medicine and Biostatistics (2 hours)
- Bioinformatics (2 hours)
- Reliability Statistics (2 hours)
- Financial Economics (2 hours)
- Methods of Applied Mathematics (3 hours)

b. MS in Applied Statistics

- Statistical Learning (3 hours)
- Multivariate Statistics Analysis (3 hours)
- Nonparametric Statistics (3 hours)
- Mathematical Finance (3 hours)
- Statistical Methods in Quality Management (2 hours)
- Statistics in Medicine and Biostatistics (2 hours)
- Bioinformatics (2 hours)
- Reliability Statistics (2 hours)
- Experimental Design (2 hours)
- Survey Sampling (2 hours)

- Financial Econometrics (2 hours)
- Statistical Simulation (2 hours)

Based on the existing curriculums in both programs, two typical study plans for this dual MS degree program are developed and described in Table 1 of Appendix 1.

The courses students take in SJTU campus that can be transferred towards IU MS program in Biostatistics are listed as follows:

1. SJTU MS students in Statistics Track

- Measure and Probability Theory (3 hours): substitutes for Stat 519 for IU MS program
- Advanced Mathematical Statistics (4 hours): substitutes for Stat 528 for IU MS program
- Linear Models and Regression (3 hours): substitutes for Biost. Method I for IU MS program
- Stochastic Processes (4 hours): approved elective for IU MS program
- Statistical Learning (3 hours): approved elective for IU MS program
- Bayesian Statistics (2 hours) or Complex Network (3 hours): approved elective for IU MS program

2. SJTU MS students in Applied Statistics Track

- Measure and Probability Theory (3 hours): substitutes for Stat 519 for IU MS program
- Statistical Inference and Decision (3 hours): substitutes for Stat 528 for IU program
- Linear Models and Regression Analysis (3 hours): substitutes for Biost. Method I for IU MS program
- Applied Stochastic Process (3 hours): approved elective for IU MS program
- Applied Time Series Analysis (3 hours): approved elective for IU MS program
- Statistical Learning (3 hours): approved elective for IU MS program

To transfer a course from SJTU to IU, the students must have earned a grade of “B” or above. Credit hours transfer will need to be approved by the IU graduate school. IU is only responsible for granting the IU MS degree in Biostatistics after the students fulfill all the IU degree requirements including passing the final competency exam taken at the end of the second year. In case students cannot complete the requirements in two years, extra time at IUPUI will be required in order to receive the IU degree.

It is requested that the IU graduate school allow an exception to the policy concerning the limit on transfer credits to allow a larger number (maximum 21 hours) of credits to be transferred from SJTU to IU, in order to implement this innovative program. This exception would only apply to this collaborative dual degree program between the two universities for the MS in Biostatistics and would not be applicable to any other programs or collaborations.

b. Program Competencies or Learning Outcomes

The competencies for the dual degree program are the same as the competencies for the regular MS in Biostatistics. The program will provide a solid grounding in study design, data collection, management and analysis as well as appropriate interpretation and communication of study findings. The program will provide students with knowledge of both statistical theory and application applied to biomedical and public health problems. Graduates will have competencies in three major areas: Public Health; Biostatistics; Data Management and Computation.

1. *Public health competency*

Public Health competency refers to having a thorough understanding of the principles of screening and disease surveillance, prevention, observational and intervention studies, the local, national and global context of health problems, and the influence of cultural and social dimension of public health research and practice.

2. *Biostatistics competence*

Biostatistical competency relates to the knowledge of Biostatistics methods and their application, such as descriptive statistics, inference and statistical modeling. Along with awareness of biostatistical principles, the program will inculcate in the students a critical thinking in the selection of the appropriate statistical technique (e.g., linear versus logistic regression, parametric versus semi-parametric modeling for survival data, or mixed effects versus generalized estimating equation models for longitudinal data).

The program will also build skills in the design of clinical (interventional) versus observational studies, data collection schemes and the analysis of the collected data plus interpretation and communication of the study results to public health practitioners both expert and non-expert in biostatistical methodology. A significant emphasis will be given to international issues affecting public health theory and practice as well of bioethics issues in research especially with respect to those arising in international or non-equitable settings.

3. *Computing and data management*

The program will emphasize the appropriate methods for the design of data collection systems in the context of biomedical research (both pre-clinical and clinical, including clinical trials and observational studies), as well as the proper management, analysis and interpretation of these data.

In addition to the collection, management and analysis of biomedical data, the program will provide a solid computational background to graduating students.

Instruction will be primarily in SAS (The SAS Institute, Cary, NC) and R¹. However, other packages (e.g., STATA) and data management packages (e.g., REDCap) will be covered. Emphasis will be given to data analysis as well as quality control and data generation (simulations).

The overarching philosophy of the MS Biostatistics program is learning by doing. This approach will culminate with the data analysis project, which will be performed under the mentorship of the student's master's thesis advisor along with other collaborators preferably outside the Department of Biostatistics. In this manner the student will be given an early appreciation of the application of biostatistical techniques in real-life settings.

In addition to the program competencies, graduates earning the MS in Biostatistics from the Indiana University Richard M. Fairbanks School of Public Health at IUPUI will demonstrate the following Principles of Graduate Learning (PGLs):

PGPL 1: Demonstrate knowledge and skills necessary to conduct biostatistical research.

Method of acquisition:

- Didactic course work
- Attendance and active participation in classes, seminars and labs
- Direct mentoring by faculty and doctoral students
- Participation in the writing of grant proposals and manuscripts

Assessment of learning:

- Ability to successfully pass all required courses and qualifying examinations
- Ability to use statistical software required of students in the program
- Direct assessment of student progress by faculty for the master's thesis

PGPL 2: Effectively communicate biostatistical results.

Method of acquisition:

- Attendance required at seminars by faculty and peers
- Presentations in meetings and seminars
- Mentored writing of grant proposals and manuscripts

¹ R Development Core Team (2012). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL <http://www.R-project.org/>.

Assessment of learning:

- Evaluation of oral and poster presentations in class, in seminars, and at conferences
- Evaluation of papers and other written class assignments
- Active participation in the writing of grant writing and manuscripts

PGPL 3: Think critically and creatively to solve problems in Biostatistics.

Method of acquisition:

- Attendance required at seminars by faculty and peers
- Solve statistical problems using SAS and other software
- Writing pre-proposal for thesis
- Writing thesis proposal

Assessment of learning:

- Grades on course assignments and class presentations
- Direct assessment by faculty on pre-proposal and thesis proposal
- Contributions to research manuscripts

PGPL 4: Conduct biostatistical research in an ethical and responsible manner.

Method of acquisition:

- Course content in research ethics
- Modeling of appropriate behavior in seminars by faculty and peers
- Direct mentoring by research director
- Mentoring by thesis committee

Assessment of learning:

- Grades in courses that contain research ethics content
- Faculty observation of student's ability to manipulate and interpret data
- Direct oversight by thesis committee on issues of research compliance and ethics

The graduate faculty of the Richard M. Fairbanks School of Public Health will conduct a review of the progress of students at the end of each semester to determine if the MS in Biostatistics Program is meeting its goals to prepare students in each of these areas. Changes that might be made include replacing faculty in certain courses, adopting new methods to present material, offering additional options for training or engaging students in external training.

c. Assessment

Faculty will ensure continuous assessment and improvement of this program through oversight of the program's evaluation and assessment process. The evaluation measures for this collaborative dual MS degree in Biostatistics that meets the highest national standards.

According to the accrediting body, the Council on Education for Public Health (CEPH), graduate programs in schools of public health must provide an interdisciplinary learning environment in which students can acquire a broad public health orientation, as well as depth of education in the discipline of Biostatistics. Since the MS program will prepare students to become researchers who are expected to work in multidisciplinary settings, the curriculum was developed to provide the MS students with a broad public health perspective. The CEPH requirements further stipulate that students be familiar with the basic principles and application of Biostatistics and develop competence in other areas of public health knowledge that are particularly relevant to their own disciplines. Opportunities for cross-disciplinary work will be afforded to students in the MS program in Biostatistics.

Quantitative and qualitative measures of performance to determine success of this collaborative dual MS degree in Biostatistics include, but are not limited to, the following:

- Applicant to Enrollee Ratio
- Number and Diversity of Active Students
- Student Performance in Required and Elective Courses
- Faculty to Student Ratio
- Student Feedback
- Biostatistical Research Opportunities
- Student Presentations at Scientific Conferences
- Average Length of Time to Complete MS Degree
- Graduation Rates (must be at least 70% to meet accreditation standards)
- Employment Rates of Graduates (must be at least 80% to meet accreditation standards)
- Feedback from Campus and Institution
- Feedback from Employers of Graduates
- Feedback from Alumni
- Feedback from the Public Health Community

d. Licensure and Certification

No state or national professional licensure is required, therefore this degree does not prepare graduates for a license or certification.

e. Placement of Graduates

The graduates are expected to work in the biomedical field analyzing the effects of treatments, environmental conditions and other factors on living things. Employment opportunities exist in healthcare-related areas in both the public (governmental) and private (business/industry). The continued growth of the pharmaceutical field is likely to generate an increased demand for biostatisticians, according to the Bureau of Labor Statistics. The BLS reports that job opportunities for biostatisticians will grow by 13% between 2008 and 2018. As of June 2011, Salary.com indicated that the median salary for biostatisticians was \$74,433. Salaries in the 25th-75th percentile range were \$61,996-\$80,330 respectively. The MS in Biostatistics will also serve as a feeder for the PhD in Biostatistics program at the Fairbanks School of Public Health at IUPUI or elsewhere.

f. Accreditation

A part of the IU Richard M. Fairbanks School of Public Health, this collaborative dual MS degree in Biostatistics will be included in the unit of accreditation by the Council on Education for Public Health (CEPH), which is an independent agency recognized by the U.S. Department of Education to accredit schools of public health. <http://ceph.org/>

6. Projected Headcount and FTE Enrollments and Degrees Conferred

All students in this collaborative dual MS degree program will be enrolled full-time. The following enrollment projections are anticipated:

Year 1 – 5 students
Year 2 – 6 students
Year 3 – 7 students
Year 4 – 8 students
Year 5 – 9 students

References

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Appendix 1: Curriculums for the dual MS program and Grading Policy in SJTU

Table 1: Study Plan for Collaborative Dual MS Degree between IU and SJTU

Year 1 (at SJTU)	
Fall	Spring
1. SJTU MS students in statistics track	
<ul style="list-style-type: none"> • Dialectic of Nature (1 hour) • English (3 hours) • Measure and Probability Theory (3 hours) • Advanced Mathematical Statistics (4 hours) • Linear Models and Regression (3 hours) 	<ul style="list-style-type: none"> • The Theory and Practice of Socialism in China (2 hours) • Scientific English (1 hour) • Stochastic Process (4 hours) • Statistical Learning (3 hours) • Bayesian statistics (2 hours) or • Complex Network (3 hours)
2. SJTU MS students in applied statistics track	
<ul style="list-style-type: none"> • Dialectic of Nature (1 hour) • English (3 hours) • Measure and Probability Theory (3 hours) • Linear Models and Regression (3 hours) • Applied Stochastic Processes (3 hours) 	<ul style="list-style-type: none"> • The Theory and Practice of Socialism in China (2 hours) • Scientific English (1 hour) • Statistical Inference and Decision (3 hours) • Applied Time Series Analysis (3 hours) • Statistical Learning (3 hours) • Statistical Software (2 hours)
Year 2 (at IU)	
Fall	Spring
<ul style="list-style-type: none"> • Biostatistics Methods III (4 hours) • Biostatistics Computing (3 hours) • Introduction to Public Health (3 hours) • Introduction of Clinical Trials (3 hours) 	<ul style="list-style-type: none"> • Biostatistics Methods II (4 hours) • Biostatistics Methods IV (3 hours) • Fundamentals of Epidemiology (3 hours) • Technical Reporting and Scientific Writing (1 hour)

Table 2: Conversion from Percentage to Letter Grade at SJTU

Percentage	Letter Grade
96-100	A+
90-95	A
85-89	A-
80-84	B+
75-79	B
70-74	B-
67-69	C+
63-66	C
60-62	C-
<60	D
P	Pass

Appendix 2: Faculty and Staff

Full-Time Faculty in the IU Richard M. Fairbanks School of Public Health Faculty

Standards for public health graduate programs have been established in the accreditation criteria of the public health accrediting agency, the Council of Education for Public Health (CEPH). These standards were developed by representatives of the accredited schools and programs in public health.

The Department of Biostatistics at the Indiana University Richard M. Fairbanks School of Public Health currently has seven full-time Biostatistics faculty. Each of the seven faculty members will dedicate their time to this collaborative dual MS program. They are (in alpha order):

1. Jaroslaw Harezlak, PhD, Associate Professor
2. Barry Katz, PhD, MPH, Professor and Chair
3. Shanshan Li, PhD, Assistant Professor
4. Ziyue Liu, PhD, Assistant Professor
5. Huiping Xu, PhD, Assistant Professor
6. Constantin Yiannoutsos, PhD, Professor
7. Ying Zhang, Ph.D, Professor and Director of Education

In addition, twelve Biostatistics faculty are members of the affiliated Department of Biostatistics at the School of Medicine (Professor Barry Katz is the Chair of both Departments). Teaching support will also be provided by the faculty members of the Department of Biostatistics at the IU School of Medicine along with numerous other faculty (full-time, part-time and adjunct) on the IUPUI campus (i.e. Department of Mathematical Sciences).

Full-Time Faculty in the Shanghai Jiao Tong University

The Department of Mathematics at Shanghai Jiao Tong University current has 10 full time statistics faculty who will dedicate to the dual MS program by providing teaching support and student supervising.

1. Xinxing Chen, PhD, Associate Professor
2. Dong Han, PhD, Professor and Deputy Chair

3. Jianzhong Lin, PhD, Associate Professor
4. Weidong Liu, Ph.D, Professor
5. Zhuling Sun, MS, Associate Professor
6. Guilan Wang, PhD, Associate Professor
7. Shuzhi Wei, PhD, Associate Professor
8. Jinguo Xian, PhD, Associate Professor
9. Liuqing Xiao, PhD, Associate Professor
10. Liqing Yan, PhD, Special Researcher

Appendix 3: Facilities - No new instructional space is required.

Appendix 4: Other Capital Costs - No new capital costs or library resources are required.

Appendix 5: Agreement of Collaborative Dual MS Degree between IUPUI and SJTU

The initial agreement for the collaborative MS degree program with SJTU was approved by the IU Affiliations Committee in May, 2014. The agreement was then revised and the current version of agreement has been approved by both IU Affiliations Committee (November, 2014) and SJTU Office of International Affairs (September, 2014) and their legal representatives. The signed agreement is included in the appendices.

Appendix 6: Exceeding the Standard Expectation of Credit Hours

The total number of credit hours to complete the dual degree is 50. It is requested that the IU graduate school allow an exception to the policy concerning the limit on transfer credits to allow a larger number (maximum 21 hours) of credits to be transferred from SJTU to IU, in order to implement this innovative program. This exception would only apply to the collaboration between the two universities for the MS in Biostatistics and would not be applicable to any other programs or collaborations.