

STAFF ANALYSIS
Proposed Ph.D in Biostatistics
Florida State University
(CIP #26.1102)

Estimated Costs:

	Total	% & \$ Current	% & \$ New	% & \$ C&G	Cost per FTE	SUS 04-05 Average Cost per FTE
Year 1	\$206,962	77% \$159,894	0% \$0	23% \$47,068	\$23,688	\$27,975 for CIP 26 at Doctoral Level
Year 5	\$280,242	80% \$223,615	0% \$0	20% \$56,627	\$13,231	

NOTE: The 26 CIP Code series includes biology-related programs that may include extensive laboratory focus. For this reason the SUS average cost is not very meaningful for comparison. In addition, the proposal indicates that all of the courses are part of the Department's existing curriculum so all of the faculty in the Department teach courses that may be taken by graduate students admitted to the program. This would eliminate the cost of new course development.

Projected FTE and headcount are:

	Projected Headcount	Student FTE
First Year	8	6.75
Second Year	8	6.75
Third Year	12	10.5
Fourth Year	16	13.5
Fifth Year	20	16.9

On April 30, 2003, the Florida Board of Governors approved eight criteria, divided into the two categories of Readiness and Accountability, by which implementation authorization of new doctorates were to be assessed. The following is an analysis of the University's proposal based on further delineations of those eight criteria.

Summary of Approval Criteria

READINESS					ACCOUNTABILITY		
Mission & Strength	Program Quality	Curriculum	Faculty	Resources	Need	Budget	Productivity
Page 2	Page 2	Page 4	Page 5	Page 6	Page 8	Page 9	Page 10

READINESS

*1. **Mission and Strength** - The goals of the program are aligned with the university's mission and relate to specific institutional strengths. The program is aligned with goals identified within the State University Strategic Plan.*

Evidence that the proposed program is responsive to the goals of the current State University System Strategic Plan and the goals of the proposed program relate to the institutional mission statement as contained in the Strategic Plan

As the first Ph.D. in Biostatistics in the State University System that is not a concentration within another degree program, this proposed degree program supports the Board of Governor's desire to increase the production of degrees in an area that meets documented statewide professional and workforce needs. Various agencies including the American Public Health Association and the National Heart Lung and Blood Institute of the National Institute of Health, have indicated a shortage and critical need for technical support in medical science and health care areas. Graduates of the program will be able to meet statewide workforce and research needs that provide critical support for academic, industry, and health professions.

The proposed curriculum encourages students to expand coursework to other disciplines such as medicine, biology, computer science, life science, epidemiology, and others in order to develop as true interdisciplinary scientists. This helps to build world-class academic programs and research capacity. Dr. Ray Carroll, Distinguished Professor of Statistics at Texas A&M University was retained as an external reviewer by FSU and stated in his report, "The Department is clearly poised to further its thrust into interdisciplinary activities. This idea appears to have taken root in the culture of the Department, and will benefit the university enormously."

Evidence of a relationship to specific institutional strengths

The proposal states that the program supports the FSU mission statement by providing research training at the graduate level. In addition, it also supports the mission of the statistics department, and other units within the University including computational science, biology, and the College of Medicine. It provides for the combination of a biostatistics and statistics core curriculum as well as the opportunity for electives that allow for study in areas of individual interest. The proposal notes that the students themselves will provide a unique resource to departments throughout the university in that they will focus on the biostatistical aspects of ongoing research in particular subject matter areas.

*2. **Program Quality** - Planning activities have been sufficient and responses to any recommendations to program reviews or accreditation activities in the discipline pertinent to the proposed program have been addressed.*

Evidence that planning for the proposed program has been a collaborative process

involving academic units and offices of planning and budgeting at the institutional level, as well as external consultants, representatives of the community, etc.

After a unanimous approval for a Ph.D. in Biostatistics by the Department of Statistics faculty, the proposal was submitted to the Science Area Chairs committee of the College of Arts and Sciences. The Department was granted approval to proceed with moving the proposal forward to the graduate policy committee. Next, this policy committee at the university requested that the Department provide clarification of the degree's relationship with the M.S. in Biostatistics and then approved it after the clarification was made. The FSU administration reviewed the proposal and approved it without further change. It was presented to the Board of Trustees at its June 9, 2006 meeting and approved.

Dr. Carroll, the outside reviewer for FSU, provided insight to the Department and university regarding a variety of issues, including the possible push in the future to establish a department of biostatistics. He said, "...It is absolutely critical for the university administration to resist this. The idea that one can form small groups of isolated biostatisticians, and at the same time maintain quality in faculty hires is simply absurd. One can however hire extremely well from a central core, namely the Department of Statistics."

Evidence of an appropriate timetable of events leading to the implementation of the proposed program

The proposal indicates that existing Department of Statistics faculty members will be assigned to the program and no new facilities or equipment will be necessary for implementation. Over half (5 of 8) of the projected number of anticipated majors from potential sources for year one are projected to come from students either currently enrolled in or recently graduated from Florida State University. Therefore, a lengthy timetable of events leading to implementation is not needed.

Dr. Jennifer Buchanan, Florida State University Associate Dean of Faculties, states that the proposed program would start in fall 2007, pending approval of the Board of Governors. Recruiting would begin as soon as possible after approval.

Evidence that progress has been made in implementing the recommendations from program reviews or accreditation activities in the discipline pertinent to the proposed program

The proposal provides evidence that the development of Biostatistics within the Department of Statistics was the number one priority in the Department's self-study for the Quality Enhancement Review in 2003-2004. The priority included the development of a program in Biostatistics that: 1. Broadens subject offerings; 2. Attracts prospective undergraduate and graduate students; 3. Creates additional research interest for faculty and graduate students; and 4. Supports the Medical Center, the Program in Epidemiology, and other related areas.

The proposal notes that there has been a cultural change within the department to stress

interdisciplinary work. FSU external reviewer Dr. Carroll stated, "The Department has made a major change in culture with its embrace of interdisciplinary research among faculty members who simultaneously maintain excellence in core research on statistical methodology and theory. This has led to major projects, and funding, in Biostatistics (an area that includes Bioinformatics), Statistical Computer Vision/Image Analysis and Oceanography, among others. The department has formulated a well thought out plan for the replacement of recently and soon to be retired faculty..."

3. Curriculum - The proposal describes an appropriate and sequenced course of study, admissions and graduation criteria are clearly specified and appropriate, and the appropriateness of specialized accreditation is addressed.

Evidence of an appropriate, sequenced, and fully described course of study; evidence of specific learning outcomes and industry driven competencies are discussed for any science and technology programs

Students graduating with a baccalaureate degree from an accredited institution who have a 3.0 cumulative undergraduate grade point average (on a 4.0 scale) and a minimum of 1100 on the Graduate Record Examination (quantitative and written) may be admitted to the program. The program includes 44 credit hours earned at a minimum of a 3.0 grade point average. Credit hours include a biostatistics and statistics core, as well as electives to allow for study in areas of individual interest. Students are required to pass three major exams: the Ph.D. Qualifying exam, the Ph.D. Comprehensive Examination, and the Dissertation Defense.

The proposal addresses student learning outcomes in both the communication skills and the content/discipline knowledge and skills areas. Learning outcomes will be verified by passing written and oral examinations and the application of methods and theory in the Ph.D. thesis. Qualifying examinations are required to be passed prior to work on a dissertation

The proposal notes that the Department presently offers a Master of Science in Biostatistics and indicates that the course requirements for the Master's degree are the building blocks for developing the research capabilities to complete the Ph.D. degree. Students entering with a master's degree in statistics or biostatistics may qualify for waivers exempting certain courses, however they still must satisfy all three qualifying exam requirements.

The curriculum and its structure appear to be inline with similar curricula offerings of peer institutions. A student seeking a Ph.D. in Biostatistics at the University of Michigan, a noted peer institution, must complete a 34 credit core and 15 hours of elective credit. Qualifying examinations are required to be passed prior to work on a dissertation.

The University of Iowa students, in another peer institution's program, are required to take a 32 credit hour core and at least 5 credit hours of electives. A Ph.D. Qualifying Examination, Comprehensive Examination, Dissertation Prospectus, and Dissertation

Defense are also required.

Evidence that, if appropriate, the bachelor's and master's degree programs associated with the program are accredited and that the institution anticipates seeking accreditation for the proposed program if available

The proposal notes that there are no specialized accreditation agencies that address this discipline, so the university will not be seeking programmatic accreditation. A review of the Council for Higher Education Accreditation website revealed no apparent accrediting bodies on education for biostatistics or statistics. However, the Council on Education for Public Health, Amended January 2002, notes in its *Accreditation Criteria: Graduate Schools of Public Health* that biostatistics is one of five areas of basic knowledge to public health and that "A school of public health must provide depth of training in each of these areas, sufficient for a student to pursue a professional degree, concentration or major, depending upon the terminology used by the institution."

Although the proposed program is developed within the Department of Statistics, it is possible for a student with an interest in public health to enroll in approved interdisciplinary courses as part of the three elective courses within the proposed curriculum.

Evidence that the institution has analyzed the feasibility of providing all or a portion of the proposed program through distance learning technologies via its own technological capabilities

The proposal notes that the program will be delivered in the traditional classroom format on the main campus. It does acknowledge that many of the courses are web augmented and most utilize a combination of traditional classroom, computing laboratories for data analysis, and use of asynchronous internet and email technology to supplement the classroom environment. As much of the program involves the need for and use of high-end computer resources, it is appropriate that the proposed program is in a campus-based traditional format.

4. Faculty – A critical mass of faculty will be available to initiate the program based on estimated enrollments, and faculty in the aggregate has the necessary experience and research activity to sustain a doctoral program.

Evidence that there is a critical mass of faculty available to initiate the program based on estimated enrollments

Eleven current and two new faculty to be hired on an existing vacant line have been listed by the institution as participating in the proposed program by the fifth year. The proposal indicates that all of the required course work is part of the department's existing curriculum so all departmental faculty may teach some of students in the program. To calculate a percentage of faculty workload, there is the assumption that 20% of the institution's graduate students would be seeking the Ph.D. in Biostatistics. Taking 20% of the Department's assumed percentages in faculty effort in teaching, advising, recruiting, thesis direction, and other related activities, the Department projects a base workload

average of 15%. This projected workload average will increase or decrease depending on each faculty member's actual assignment and involvement in the area of study.

To compare the FSU faculty projections with another institution's projections in a similar situation, Dr. Jacqueline Mok, Vice Provost at The University of Arizona, was contacted concerning her university's plans to implement a Ph.D. in Biostatistics. Although the Arizona program is designed within the College of Public Health, it is similar to the proposed Florida State University program in that it is coming out of an established program with established faculty. Dr. Mok indicated that some 14 current and two new hires will be working with the new program when established. Arizona estimates approximately eight (8) Ph.D. students enrolled in the program the first year. By comparison, both the faculty and enrollment estimates are similar to the respective 13 and 8 by Florida State. Dr. Mok also noted that they anticipate adding eight new students a year. This is slightly higher than the anticipated 20 students by year five at Florida State, but because projected FTE calculations were unavailable, it is difficult to determine if the extra 12 students at The University of Arizona still convert to a similar FTE as Florida State.

An established Ph.D. in Biostatistics was also consulted for comparison. The Ph.D. program in Biostatistics at Columbia University was first approved in 1977, and graduated its first candidate in 1982. Dr. Bruce Levin, Professor and Chair of the Department of Statistics at Columbia indicated that there are primarily 13 faculty within the department that are the "heavy lifters" of the program. He said that there are 21 candidates currently in good standing and actively pursuing their degrees, which is again similar to the Florida State future projection.

Evidence that the faculty in aggregate have the necessary experience and research activity to sustain the program

The proposal provides evidence that all currently listed faculty have published and all but three have directed Ph.D.s. Dr. Myles Hollandar and Dr. Daniel McGee have each published over 100 pieces of work. In addition, Dr. Hollandar received the Noether Award in 2005 from the American Statistical Association, an award that is presented to only one statistician a year for work in the field of non-parametric statistics.

The proposal notes that "Members of the Department of Statistics presently hold grants from the National Science Foundation, the Department of Defense, the National Institutes of Health, The IBM Foundation, and several agencies of the State of Florida."

Evidence that, if appropriate, there is a commitment to hire additional faculty in later years, based on estimated enrollments

The institution indicates that no additional faculty beyond its presently anticipated growth will be required to implement and manage the program.

5. Resources – The necessary library volumes and serials; classroom, teaching laboratory, research

laboratory, office space, equipment, clinical and internship sites, fellowships, scholarships, and graduate assistantships will be sufficient to initiate the program.

Evidence that library volumes and serials are sufficient to initiate the program

The proposal states that there are over 7,000 volumes related to statistics alone in the library catalogue at Florida State University. In addition, there are over 2,000 titles concerning public health, over 300 with epidemiology, over 1,000 with genetics, over 2,500 with computer science, and almost 7,000 with biology that may be applicable. These are fields in which biostatisticians often conduct interdisciplinary research.

Students have access not only to print materials but electronic search engines with retrievable abstracts, manuscripts, and other documents, along with access to on-line materials of any of the state universities in Florida. The Agency for Health Care Administration and the Tallahassee Memorial HealthCare libraries are also available to students for research.

Evidence that classroom, teaching laboratory, research laboratory, office, and any other type of space that is necessary for the proposed program is sufficient to initiate the program

The proposal notes that there are four dedicated classrooms for the Department of Statistics use, and additional classroom space is available in other buildings. Two of the classrooms provide a seating capacity of 60. These classrooms allow instructors to put many course materials on a central server and access the materials. The two other classrooms are smaller (seating capacity of 16 and 10 respectively) are equipped with state of the art computer equipment and have the ability to project the computer screen for viewing by students. It is anticipated that as the wireless network improves on campus, all of these classrooms will evolve into classrooms that will allow an interactive teaching environment.

Evidence that necessary and sufficient equipment to initiate the program is available

The proposal indicates that the Department of Statistics, by having its own computer system along with administering its own local area network, provides a state of the art environment for the students. Graduate student offices contain a workstation and personal computer, plus there is a common computer room that allows students to be connected to other local networks on campus and to the Internet.

Students have access to all major statistical packages, including commercial software such as SAS, Stata, S-Plus, and Matlab as well as a wide array of open-source software as R and Octave. Microsoft Office, the Latex typesetting system, and Adobe software is also available for use.

Evidence that, if appropriate, fellowships, scholarships, and graduate assistantships are sufficient to initiate the program

Although apparently not specific to the proposed doctoral program, the proposal indicates

that there are over 30 graduate teaching assistantships through the Department of Statistics. There are also research fellowships funded through faculty research grants. Students in the doctoral program are eligible to apply for University fellowships.

In addition, current students have been successful in gaining external funding as two were awarded predoctoral fellowships from the American Heart Association.

Evidence that, if appropriate, clinical and internship sites have been arranged

There are no required internships, although there are voluntary internships available in industry and government.

ACCOUNTABILITY

5. Need – *There is a need for more people to be educated in this program at this level and if the program duplicates other professional and doctorate degrees in Florida, a convincing rationale for doing so is provided.*

Evidence that there is a need for more people to be educated in this program at this level

The proposal provides evidence that biostatistics is a growing field attracting individuals with advanced degrees. It notes a recent article in STATS (Dixon, D. and Legler, J., “Careers in Biostatistics: High Demand and Rewarding Work”, 37, 3-7, 2003), describing the demand and importance of this field. The proposal continues to note that a nationwide shortage of biostatisticians means there are positions available in academia, in industry, and in government.

A review of its website found that The Florida Area Health Education Network notes on its Florida Health Careers shows, “The job outlook for biostatisticians in Florida is strong. The increase in federally funded health-related research projects has as a result increased dramatically the need for biostatistical support. New fields of study requiring specialized biostatistical knowledge, such as statistical genetics and medical imaging, are growing at a rapid pace. Biostatisticians also can find jobs in related areas such as veterinary medicine, botany, and wildlife research.... Most jobs require a master’s or doctoral degree.”

In addition, The American Statistical Association website notes that “Biostatisticians with advanced degrees can look forward to excellent career opportunities in government, industry, and academia. The shortage of biostatisticians is noted in The Seventh Report to the President and Congress on the Status of Health Personnel in the United States and Objectives for the Nation. Job prospects for new Masters and PhD graduates in biostatistics are excellent. Typical starting salaries range from \$35,000 to \$65,000 for Master’s degrees and from \$55,000 to \$85,000 for PhD degrees.”

According to Table 252 from the Digest of Education Statistics 2005 by the National Center for Education Statistics entitled “Bachelor’s, master’s, and doctor’s degrees conferred by degree-granting institutions, by sex of student and field of study 2003-04” showed that there were only a total of 85 Ph.D.’s in Biostatistics were conferred during that year.

Evidence that the proposed program does not duplicate other SUS or independent college offerings or, otherwise, provides an adequate rationale for doing so

The proposal indicates that, to the Department of Statistics' knowledge, there is no Ph.D. in Biostatistics offered in the State University System or in the state of Florida. However, The University of Florida and The University of South Florida both have a concentration in Biostatistics within a Ph.D. program in Public Health. The Independent Colleges and Universities of Florida verified that there was no listing Ph.D. program in this growing specialization of statistics on their inventory of programs.

Evidence of reasonable estimates of student headcount and FTE who will major in the proposed program, and commitment to a diverse student body

The proposal notes that there is interest in the pursuit of a Ph.D. in Biostatistics on the part of some of the graduate students currently in study within the Department. It is anticipated that some of the students presently listed to obtain the Ph.D. in Statistics will transfer to the Biostatistics program. It should be noted that the development of this program may assist with the current attrition rate in the department of statistics graduate programs due to students transferring to enroll in Biostatistics programs at other institutions.

The Department indicates that it will continue its attempt to ensure diversity through such activities as networking with Florida A&M University and Florida International University and communicating through select mailing lists and list serves that assist targeted student groups. The University Director of Diversity and Compliance has signed her review of the proposed efforts to attain a diverse student body..

7. Budget - A complete and realistic budget for the program is provide, and any redirection of funding will not have an unjustified negative impact on other needed programs.

Evidence of a budget for the program that is complete and reasonable, and comparable to the budgets of similar programs at other SUS institutions, and reflective of the proposal's text

Costs associated with the increase in student enrollment will be handled in the Department's long term goal of increasing the production of Ph.D. degrees.

The proposal provides evidence that the proposed first year costs would be \$206,962 (\$159,894 current general revenue and \$47,068 contracts and grants). It also indicates that the proposed fifth year of costs would be \$280,242 (\$223,615 current general revenue and \$56,627 contracts and grants). No new money is requested for either year.

Additionally, the proposal notes that the implementation of the program will enhance interdisciplinary research by involving both biostatistics faculty and graduate students in this research. The University indicates that this involvement should result in increased funding for both biostatistics faculty and their interdisciplinary co-workers.

The State University System 2004-2005 Average Cost for doctoral degrees in the Classification of Instructional Programs Code (CIP) 26 was \$27,975. The anticipated first year cost per FTE for the biostatistics program is \$23,688. It is estimated that the cost per FTE by year five will be \$13,231. Existing Department of Statistics faculty members will be assigned to this program with no anticipated direct impact on the workload of current faculty or other programs. It is also noted that no additional facilities and resources are required for the initiation of the proposed program

Evidence that, in the event that resources within the institution are redirected to support the new program, such a redirection will not have a negative impact on undergraduate education

The proposal provides evidence in its assessment of current and anticipated faculty that there is a refocus of services within the graduate student area. No negative impact on undergraduate education was identified. The University is hoping that the Ph.D. program in Biostatistics will encourage an increase in the number of undergraduate biostatistic majors, who will then feed into the Ph.D. program.

Additionally, resources lost due to student attrition may be gained back as students stay at the university because of the new degree offering in their desired area of specialty. The proposal notes that almost 50% of the Department of Statistics' students enrolled in the present Ph.D. in Statistics drop out after the Masters degree. Some of these students have recently transferred to universities offering a Ph.D. in Biostatistics.

8. Productivity - The academic unit(s) associated with this new degree have been productive in teaching, research, and service.

Evidence that the academic unit(s) associated with this new degree have been productive in teaching, research, and service

The proposal indicates that core department of statistics faculty teach three or four courses in each academic year, in addition to their work advising, mentoring, tutoring directed individual study, and guiding/serving on master's and doctoral committees. Fifteen statistics courses are required for the program; these courses should be easily handled between thirteen faculty.

Department faculty have been recognized both by the University and nationally for their scholarship. Five of the department's professors have been named FSU Lawton Distinguished Professors and one of the faculty was awarded a named professorship, the Ralph O. Bradley Professor of Statistics. Faculty include fellows of the American Statistical Association, the Institute of Mathematical Statistics, and the American Heart Association as well as being elected members of the International Statistical Institute.

In addition, faculty provided research service to the national community by serving on review panels for the National Science Foundation, the National Institutes of Health, the

Centers for Disease Control and the Department of Defense.

Finally, members continue to be active in seeking and obtaining external funding for research. Members currently hold grants from the National Science Foundation, the Department of Defense, the National Institutes of Health, the IBM Foundation, and several agencies of the State of Florida.