SAINT LOUIS UNIVERSITY

Program Assessment: *Annual Report*

Program(s): B.S. Biostatistics

Department: N/A – Undergraduate Public Health Programs

College/School: College for Public Health and Social Justice

Date: June 28, 2018

Primary Assessment Contact: Lauren D. Arnold, PhD, MPH

1. Which program student learning outcomes were assessed in this annual assessment cycle?

The Biostatistics major began AY 2015-2016. Per the course roll-out plan, the major's 4000-level courses (BST4100, BST4200, and BST4400) were offered for the first time in AY2017-2018. The first BS-Biostatistics students graduated in May 2018. Following the assessment plan, LOs 1-4 were assessed in AY2017-2018.

LO1: Perform computations, derivations and calculations as they relate to calculus and linear algebra.
LO2: Use standard statistical software to create and manage datasets and perform basic statistical tests
LO3: Appropriately communicate statistical results.
LO4: Apply the public health model to biostatistical work.

2. What data/artifacts of student learning were collected for each assessed outcome? Were Madrid student artifacts included?

LO3 was assessed using:

- Exam questions from BST3100 in Fall 2017 (per assessment plan)
- Exam questions from EPI4000 in Fall 2017 (added to what was proposed in the assessment plan)
- Capstone project from BST4400 in Spring 2018 (per assessment plan)

LOs 1, 2, and 4 were assessed using:

- Capstone project from BST4400 in Spring 2018 (per assessment plan)

Madrid artifacts were not included in the assessment as BST courses are not offered in Madrid.

3. How did you analyze the assessment data? What was the process? Who was involved?
NOTE: If you used rubrics as part of your analysis, please include them in an appendix.

LO3: BST3100 (Applied Biostatistics I) and EPI4000 (Introduction to Epidemiology) instructors identified a sample of exam questions that mapped to LO3 (Appendix A). In BST3100, the average score and distribution of scores for the LO3 final exam question were calculated. In EPI400, the distribution of percentage of questions answered correctly was calculated. LO3 was also assessed using the Capstone project as described below.

LOs 1, 2, 3, and 4: The BST4400 instructor developed a rubric (Appendix B) that mapped course LOs 1-4 to Capstone project elements, which in turn mapped to specific biostatistical skills. Using the written paper and oral presentation, each student was evaluated for achievement of LOs as follows:

- 0 = Student did not demonstrate understanding of LO (<70% of skills demonstrated)
- 1 = Student demonstrated understanding of LO at a basic level (70-100% of skills demonstrated)
- 1.5 = Student demonstrated understanding of LO at advanced level (>100% of skills demonstrated)

As LOs 2-4 each mapped to multiple skills, a "coverage" score was calculated, followed by the "coverage %"; this percentage mapped back to the LO achievement scale outlined above. (Coverage score of 100% = "1";

< 100% = “0”; >100% = “1.5”.) For example:

- $LO2_{coverage}$ = missing data plan score + power score + simple methods data cleaning + multiple imputation score
- $LO2_{percentage}$ = ($LO2_{coverage}$ / 4) * 100

The rubric used to evaluate the Capstone project for achievement of LOs is attached (Appendix A).

The graduation exit survey was administered in April/May 2018. Students were supposed to rate their perceived achievement of LOs 1-4 on a scale of 1 (very uncomfortable) to 5 (very comfortable). Our goal was that 80% of students would report achievement at a level of 4.0 or higher (comfortable/very comfortable). However, the BST-PLO questions were inadvertently omitted from the survey, and thus there were no indirect assessment data from the four BST majors who responded to exit survey.

4. What did you learn from the data? Summarize the major findings of your analysis for each assessed outcome.
NOTE: If necessary, include any tables, charts, or graphs in an appendix.

In summary, evaluation of the Capstone project found that 100% of students (n=5) achieved or exceeded LO1, LO2, and LO4, and 80% of students (n=4) achieved or exceeded LO3.

	Student 1	Student 2	Student 3	Student 4	Student 5	Average	% achieving outcome
LO1	1	1	1	1	1	1	100%
LO2	1	1	1	1	1	1	100%
LO3	0	1.5	1	1.5	1.5	1.1	80%
LO4	1	1	1	1.5	1	1.1	100%

LO1: Evaluation of the Capstone project found that 100% of students achieved LO1.

LO2: Evaluation of the Capstone project found that 100% of students achieved LO2.

LO3: Evaluation found that the majority of students (80%, n=4) achieved LO3 on the Capstone project; 75% achieved LO3 on the BST3100 final exam, and 60% (n=3) achieved LO3 by answering all three selected EPI4000 exam questions. Specifically:

Capstone project – Although 80% of students achieved LO3, there was variation in degree of achievement: 60% (n=3) exceeded achievement; 20% (n=1) achieved LO3; and 20% (n=1) failed to achieve LO3.

BST3100 exam questions (Appendix B) – One final exam question assessed LO3, graded as:

- 3 pts: Correct answer
- 2 pts: Generally correct approach, but error(s) in the procedure or interpretation
- 1 pts: Incorrect approach
- 0 pts: Failed to address the question

The four biostatistics students in the course had an average score of 2.25 on this problem with a distribution of: 3 = 2 students; 2 = 1 student; 1 = 1 student.

EPI400 exam questions (Appendix B) – One question on exam #1 and two questions on exam #2 that assessed LO3 were identified. The distribution of answers for the five BST majors in class was: 3 questions correct = 3 students; 2 questions correct = 1 student; 1 question correct = 1 student.

LO4: Evaluation of the Capstone project found that 100% of students achieved or exceeded LO4. Of these 20% (1 student) exceeded achievement of LO4 and 80% (n=4) achieved LO4.

5. How did your analysis inform meaningful change? How did you *use the analyzed data to make or implement recommendations for change* in pedagogy, curriculum design, or your assessment plan?

As the Biostatistics major is only in its third year, the first class of **five students** graduated in May 2018. Thus, this is the first year for Capstone data. These data indicate an early positive trend, that the curriculum has been designed in a way that enables students to achieve or exceed achievement of PLO 1, 2, and 4 by graduation. For example, including Public Health courses (e.g. PUBH2100, PUBH3200, EPI4000) in

the curriculum may be what helps make the connections between biostatistical procedures/theories and population-level implications, thus strengthening LO4.

One potential gap identified is in LO3. Capstone project data indicated that only 80% (n=4 students) achieved LO3. Similarly, assessment of this outcome via exam questions in BST3100 and EPI4000 (taken earlier in the curriculum than Capstone), found that 75% (n=3) and 60% (n=3) of students respectively achieved LO3. This suggests that we need to look more closely at LO3 and how to strengthen the foundation for this outcome in lower-level BST courses in order to strengthen achievement of LO3 in the Capstone project. BST3100 and EPI4000 instructors may need to spend additional time teaching LO3-associated concepts and having students practice the interpretation of statistical findings in order for students to be more confident and able in this skill by Capstone/graduation.

Importantly, as the major is new with only 5 graduates, we look forward to growing the "n" and making program level changes (e.g. revisions to the Capstone project or lower-level course content) in future years.

6. Did you follow up ("close the loop") on past assessment work? If so, what did you learn? *(For example, has that curriculum change you made two years ago manifested in improved student learning today, as evidenced in your recent assessment data and analysis?)*

The only prior assessment of this major occurred in AY2016-2017 and focused on LO3 as assessed via exam questions in BST3100. Current data supported what was found with LO3 assessment in 2016-2017 and indicate that achievement of LO3 may be weaker than that for LO1, 2, and 4. Again, because of the small sample size, this is something that will be monitored in upcoming years.

IMPORTANT: Please submit any revised/updated assessment plans to the University Assessment Coordinator along with this report.

**Please note that the Undergraduate Public Health Steering Committee will review this report and discuss/select LOs to focus on for AY 2018-2019 assessment. The assessment plan will be revised (if needed) at that time.*

Appendix A: Exam Questions from BST3100 and EPI4000 Used to Assess LO3

BS-BST LO3: Appropriately communicate statistical results.

1. **BST3100 Final exam question:** *"Check for pairwise differences in birthweight between racial/ethnic groups using Bonferroni adjustment. How many tests are being run? Report the average birthweights for all racial/ethnic groups and note which groups are significantly different."*

2. **EPI4000 exam questions:**

- **Exam 1, Q58:** The Department of Health wants to compare death rates in Jefferson and St. Louis Counties. A crude death rate of 1.2 per 1,000 was reported in Jefferson County. St. Louis County data are below:

Age Group	St. Louis County Population	# of Deaths
< 30	34,550	55
30 to <65	74,280	230
≥ 65	64,020	400

Using these data, you conclude everything **except**:

a. About 4 people for every 1,000 die in St. Louis County each year.
b. As expected, the death rate increases with age.
c. The middle age group is dying at about 2-times the rate of the < 30 year-olds.
d. Jefferson County is a healthier place to live than St. Louis County.

- **Exam 2, Q40:** As part of a survey, 1,500 nursing home residents are asked about suffering a broken hip while living in the home, use of a cane, and need for glasses. It is found that 222 residents suffered a broken hip at some point while living in the nursing home; 1,030 need glasses; and 850 use a cane. Based on this study, you know that:

a. Incidence of falls in this population is 14.8 per 100 residents.
b. Prevalence of cane use in this population is 56.7%.
c. To say that residents who use a cane are at increased risk of falls is to commit ecological fallacy.
d. There is a causal relationship between cane use and falls.

- **Exam 2, Q59:** On Dec 6, the St. Louis City Department of Health received reports of 12 SLU students with stomach cramps, fever, and vomiting. Lab tests confirmed *E. coli* infection. Investigation found that the 12 students lived in the same learning community, and had the following food histories:

Food item	Ate Item		Did not eat item	
	Sick	**Well**	**Sick**	**Well**
Spaghetti with sauce	4	1	2	5
Meatball sandwich	4	1	1	6
Chinese takeout	1	8	1	2

What is the <u>most likely</u> cause of the outbreak and why?

a. Spaghetti with sauce and meatball sandwich because the attack rate for people who consumed those foods are the same.
b. Meatball sandwich because the attack rate for people who didn't have that item is the lowest.
c. Meatball sandwich because undercooked meat can be a source of *E. coli*.
d. Meatball sandwich because the ratio of attack rates is the highest.

Appendix B: BST4400 Capstone Project Rubric for Assessment of Program Learning Outcomes

BS-BST LO1: Perform computations, derivations and calculations as they relate to calculus and linear algebra.
BS-BST LO2: Use standard statistical software to create and manage datasets and perform basic statistical tests.
BS-BST LO3: Appropriately communicate statistical results.
BS-BST LO4: Apply the public health model to biostatistical work.

Evaluation of performance		
0	Failed to achieve	Student did not demonstrate understanding of learning objective (<70% of skills demonstrated)
1	Achieved	Student demonstrated understanding of learning objective at a basic level (70 to 100% of skills demonstrated)
1.5	Exceeded expectations	Student demonstrated understanding of learning objective at an advanced level (>100% of skills demonstrated)

Program Learning Objectives (LO) mapped to elements of and specific skills required in the Capstone Project

Category	**Specific Skill**	**Program Learning Objective**	**Oral Presentation[a]**	**Written Paper[a]**	**Coverage[b]**
Models	Create process model (show clarity, comprehensiveness, and explanation)	BST-LO4			
Data cleaning	The plan should address identifying and rectifying outliers	BST-LO2			
	Assessing validity of responses (only one or two examples needed)	BST-LO4			
	Any other check for cleanliness that you can derive…be creative	BST-LO4			
Sample Size	Sample Size	BST-LO1			
	Power	BST-LO2			
	Presentation of sample size	BST-LO3			
Missing data	Simple methods	BST-LO2			
	Multiple imputation	BST-LO2			
	Comparison	BST-LO3			
Methods Section	Research questions	BST-LO4			
	Information about data	BST-LO3			
	Planned statistical methods	BST-LO3			
Results Section	Written results	BST-LO3			
	Results tables	BST-LO3			

[a]Scored 0, 1, or 1.5 as outlined above
[b]Highest score of oral presentation and written paper

Program Learning Objective	**Coverage Sum**	**Percent Coverage**	**Performance on LO**
LO1	Sum of coverage scores for corresponding skills above	(Coverage Sum / # of skills)*100	0 = < 100% 1 = 100% 1.5 = >100%
LO2			
LO3			
L04			