Statistics: An Essential Department for a Modern R1 University

2025-10-08

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1 Executive Summary

The Statistics department at UNL is an integral part of the university infrastructure, and like other essential infrastructure (roads, plumbing, electricity), it can be easy to overlook our contributions to the university ecosystem.

Statistics courses are used across campus to instill quantitative literacy (Stat 218, 380), teach undergraduate and graduate students the basic skills they need for domain research and job training(Stat 462, 463, 801, 802, 850, 870), and to provide advanced statistical education (Stat 821, 822, 823, 882, 883, 950) for a variety of different disciplines including agronomy, statistical genetics, and finance.

Statistics also serves two different research functions: we conduct our own research, which leads to methods which are more efficient both in terms of data collection (e.g. better analyses, software packages, etc.) and in how data are written up for publication (knitr, rmarkdown, ggplot2). In addition to our research, however, we also serve as collaborators on domain research problems. These problems can inspire new statistical research questions, but even when that does not occur, collaborative activity emphasizes the relational aspects of statistics. While collaborations can take a long time to produce measurable fruit, these relationships are the foundation of statistical practice.

In addition to collaboration, statistical consulting provides an essential service across the university, helping graduate students and professors get research out the door quickly and with maximal power.

Ultimately, eliminating the statistics department would cripple the university's research and teaching infrastructure and threaten its ability to maintain its membership in the Big Ten or rejoin the AAU. Instead, the department recommends a bold plan that is aligned with Dr. Gold's Odyssey to the Extraordinary objectives: create a centralized structure that will facilitate collaboration, consulting, and teaching across many departments on both East and City campuses, as well as eventually UNMC. Strategically invest in a department that can supercharge the research metrics across the university.

Important links:

- Detailed statistical analysis of variables used in the budget proposal analysis
- Analysis of problems with the data used in the budget proposal analysis

2 Introduction

On September 11, 2025, the Statistics Department was informed that it had been proposed for elimination under the Chancellor's budget reduction proposal.

> When the process is invoked, the Chancellor will provide a framework document that describes the issue(s), including a rationale for the proposed reduction(s), the scope of the reduction/reallocation, and a desired timeline for completing the review process and implementing the changes. The document will be made available to the Chancellor's Executive Leadership Team and the following shared governance partners: the Academic Planning Committee (APC), the deans, the Executive Committee of the UNL Faculty Senate, appropriate representatives of the Staff Senate, and appropriate representatives of the Association of Students of the University of Nebraska (ASUN).

The rationale for the proposed reductions provided in the budget reduction plan is as follows:

> The proposed plan would eliminate a standalone Department of Statistics offering BS, MS, and PhD degrees and moves the university toward a distributed model that leverages expertise embedded across IANR, UNL and the NU system. The plan proposes to strategically deploy a portion of the state-appropriated funds to continue to offer selected undergraduate and graduate courses and provide coordinated statistical consulting. Budget reductions would be achieved through the elimination of positions (12 FTE).

That is, the only rationale offered is that the Chancellor proposes to move towards a distributed model that "leverages expertise embedded across IANR, UNL, and the NU system". The distributed model has been tried before at UNL, within both IANR and the College of Arts and Sciences, and the end result was the creation of a stand-alone statistics department (though only after nearly every other possible model was proposed and attempted).

2.1 Outline

Chapter 3 discusses statistics within the University of Nebraska System, with a focus on the University of Nebraska – Lincoln. Section 3.1 provides a brief history of the Statistics Department at UNL and its associated graduate and undergraduate programs, along with the rationale used to motivate past changes to the department structure. This historical data is used to assess the plan to move toward a distributed

model of embedding statisticians within other departments on campus.

Section 3.2 examines the role of the Statistics Department on campus, outlining its integration with the teaching, research, and extension missions within the university. Section 3.3 examines other clusters of statistical expertise within the University of Nebraska system, including related departments at UNL, Biostatistics at UNMC and Mathematics departments at UNO and UNK. These additional clusters of statistical knowledge are critically assessed to determine whether any other unit or the combination of all other units have the capacity to replace the functions of the Statistics department without hiring additional FTEs and reducing the savings from the proposed elimination of the department.

Chapter 4 examines the metrics used to evaluate the performance of the department and makes the case that the reliance on these metrics demonstrates the importance of accounting for random variation and contextual information when interpreting data – that is, that the Statistics department is a necessary component of decision making across the university.

Chapter 5 discusses the presence of statistics departments within the AAU, Big Ten, R1, and land-grant classifications, examining the viability of a distributed model based on data from peer institutions.

Chapter 6 examines the programs housed within the Statistics department as well as important contributions made by the department to other programs, and evaluates the impact of closing the department on the university and the state.

Chapter 9 provides an alternative plan to situate the Statistics department within the university in a way that will best position UNL to rejoin the AAU and serve the state of Nebraska by strengthening research, teaching, and extension missions of the university.

Throughout this report, additional resources and references are directly linked (rather than providing a bibliography and formal citations) to ensure that APC has the necessary information immediately available.

3 The UNL Statistics Department

3.1 History of the Department

- 1957 - Statistics Laboratory founded at UNL under Dr. Charles Gardner, funded by the Agricultural Experiment Station to provide design, analysis, and data processing services to researchers.

> **ℹ Consulting Headcount**
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> Under the current proposal, only one FTE would be responsible for statistical consulting, across the UNL campus. This reduction would take UNL back to 1957 in the amount of statistical consulting assistance available across campus (and even then, they quickly hired additional statisticians due to consulting demand). Without graduate students at the SC3L, who currently provide over 100 hours per week of dedicated consulting time, the preservation of a single FTE for statistical consulting represents a dramatic reduction in capacity during a period of greatly increased demand across IANR as well as the wider university.

- 1968 - UNL attempts to create a School of Computational Sciences with two departments: Computer Science and Statistics, but it fails. Instead, the Mathematics Department is renamed the Department of Mathematics and Statistics to account for the growing relevance of Statistics across the university.

- 1968 - Dr. Wilfred Schutz becomes head of the UNL Statistics Laboratory. At this point, the Statistics laboratory consists of Dr. Schutz, one additional faculty member, a data processing programmer, a computer operator, data entry personnel, and a secretary. Faculty members hold academic appointments in Agronomy.

- 1972 - Statistics courses are transferred to the Statistics laboratory from Agronomy. Several new faculty are hired due to growing demand for consulting services and additional courses.

- Early 1970s - A Ph.D. program in statistics is discussed involving faculty from Math, Biometrics, Educational Psychology, and other departments (1993 Biometry Department Self-Study, page 30).

- 1978 - The Statistics Laboratory is renamed the Biometrics and Information Systems Center.

While the [Mathematics and Statistics] department gave me a fine education that served as the basis for the remainder of my career, statistics at UNL struggled to gain respect in both the academic and professional communities during its combination with mathematics. The decision to finally separate the two and form the Department of Statistics on the East Campus was a major win for statistics in Nebraska, and has led to enormous benefits. – Brad Carlin, UNL Math & Statistics alumni, former faculty at CMU and University of Minnesota Statistics, President of Biostatistical Consulting

- 1985 - A committee is formed to study the feasibility of combining the Statistics portion of the Mathematics Department and the Biometrics Department into a Department of Statistics (1993 Biometry Department Self-Study, page 31).

- 1987 - The Biometrics and Information Systems Center is divided into the Biometrics Center and IANR Computing, as recommended in 1985 self-study (1993 Biometry Department Self-Study, page 31).

- 1988 - The Division of Statistics is established as a subgroup within the Department of Mathematics and Statistics (2001 Mathematics & Statistics Department Self-Study)

- 1989 - The Department of Biometry is established from the Biometrics Center. Faculty from the Biometrics Center hold academic appointments in the Biometry department. (1993 Biometry Self-Study, page 9)

- 1990 - The Board of Regents approves an MS program in Biometry (1993 Biometry Self-Study, page 20).

- 1993 - The Mathematics APR Report recommends creation of a separate department of statistics (2001 Mathematics & Statistics APR Self-Study, pg 147)

> **i** Motivation for Stand-alone Statistics Department
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> - Retention: faculty left after only a few years because of lack of recognition of statistics as a discipline by the university.
> - A separate department will strengthen the research and teaching in statistics
> - A separate department will enrich the research of statisticians who are currently in the departments of Mathematics and Biometry

- 2000 - A largely-autonomous Division of Statistics is created within the Department of Mathematics and Statistics with a focus area in survey sampling to support the Gallup Research Center (2001 Mathematics & Statistics APR Self-Study, pg 14).

- 2003 - The Statistics Department is founded from the Department of Biometry (IANR) and the Statistics faculty from the Department of Mathematics and Statistics (2005 Statistics APR, pg 3)

- 2003 - A Statistics PhD program is created within the newly-formed Statistics Department.

> ℹ Reasons motivating the PhD Program's initiation:
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> - Recruit better graduate students
> - Enhance ability to do research using PhD graduate students
> - Enhance consulting via both research and satisfying increasing consulting demand using well-trained and supervised graduate students.
> - PhD students can lead graduate course labs for MS students, reducing the instructional burden on faculty
> - PhD students enhance professional development for faculty by facilitating research and consulting collaborations

- 2005 - APR Team recommends better integration and outreach to city campus and assessment of service teaching needs in other departments.

- 2013 - APR Team recommends reducing graduate program enrollment and creation of an undergraduate and 4+1 BS+MS program.

> ℹ Specific Recommendations
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> - Graduate program enrollment reductions (no more than 5/1 student/faculty ratio)
> - More collaborative and cross-listed courses with Departments of Mathematics and Computer Science.
> - Creation of an undergraduate program and a 4+1 BS+MS statistics program.
> - Use of Online/blended delivery and flipped classroom approaches to improve learning and reduce instructional costs.
> - Hiring a Professor of Practice position to cover program administration, advising, and instructional needs.

- July 1, 2018 - The Statistics department fully separates from the College of Arts and Sciences and is 100% supported by the Institute of Agriculture and Natural Resources.

- Fall 2019 - The Statistics department begins to design an undergraduate major in Statistics and Data Analytics at the request of CASNR Dean Tiffany Heng-Moss and in response to the recommendations from the 2013 APR.

- 2021 - APR team recommends increasing the number of tenure-track faculty to 20, hiring several teaching faculty to increase instructional efficiency and capacity, and adding departmental administrators to ensure program success.

- Fall 2021 - Statistics and Data Analytics major approved by the Board of Regents

- June 2022 - Data Science Major approved by Board of Regents with programs in CASNR, CAS, and Engineering
- Fall 2022 - First Statistics and Data Analytics freshman cohort begins classes
- Spring 2026 - First Statistics and Data Analytics cohort expected to graduate

3.2 The Role of a Statistics Department

> From artificial intelligence to traditional statistics, the future of STEM is data science and big data. Statistical expertise is the bedrock of data-driven decision-making in every field, from agriculture and medicine to engineering and business. To eliminate this department would be to cripple UNL's ability to innovate and maintain its competitive edge as a leading research institution contributing to the competitiveness of our state and nation. Eliminating the Department of Statistics would send a clear message that the university is de-prioritizing foundational scientific principles.
>
> I urge you to consider these compelling arguments. The Department of Statistics is not a luxury; it is a necessity for the success of the UNL Center for Plant Science Innovation and for the university as a whole. Please reconsider this decision and preserve a department that is so central to our academic and research mission. – Center for Plant Science Innovation

A statistics department provides a number of services within the campus ecosystem apart from its own programs (which often exist to provide these services efficiently).

- Statistics is an **essential component of undergraduate quantitative literacy**; over 20% of UNL undergraduates take Stat 218 to fulfill their Ace 3 requirements.
- Statistics supports additional quantitative coursework for other departments: Stat 318 and 380, as well as Stat 462 and Stat 463, which are an essential component of the Actuarial Sciences program.
- The department provides graduate training in statistical methods (Stat 801, 802) and in computing and data visualization (Stat 850). These courses facilitate research across the university, in a way that is important, but difficult to explicitly measure.
- Graduate committees often recommend additional coursework in Statistics: experimental design, specific methodologies (e.g. Bayesian statistics), computational methods, or statistical genetics.

Without a centralized statistics department and the expertise of statistics faculty, each department must solve the problem of providing this coursework separately.

> The training my own students receive from Statistics – from coursework, from collaborators, and from Statistics faculty on their thesis and dissertation committees – is essential to our ability to win and execute upon large federal research awards. Our institute's capacity to train students whose expertise bridges quantitative techniques and in the field understanding of crop

systems is why I receive e-mails from Corteva, Syngenta, and Bayer asking when my lab's next PhDs will be graduating.

– James Schnable, Letter to APC

On the research side, a statistics department should have collaborations with many scientific departments across campus, assisting with the development of new methodology as well as consulting on the appropriate established methodology to use. This dual collaboration and consulting function of a statistics department is critical for ensuring that the scientific results published by researchers are valid and for accelerating progress within other fields. A major research university without a statistics department is as difficult to imagine as a university known for its engineering programs that doesn't have a mathematics department to assist with teaching calculus and differential equations or a physics department to teach statics and mechanics.

Statistics is the midwife to all other departments. UNL has a strong agricultural mission and a proud track record in agronomy. So does statistics. My field was started by Sir Ronald Fisher, who worked to analyze agricultural data at the Rothamsted Experimental Station before moving on to University College London and eventually the University of Cambridge. The work that Fisher did laid the mathematical foundation for continual improvement of yields. His co-founding of statistical genetics has been the basis for nearly all improvement in agriculture over the last 100 years (aside from the Haber-Bosch process, which gave us plentiful fertilizer). But statistics doesn't just feed agronomy. It provided the necessary confirmation of the Higgs boson in physics. It undergirds the risk analyses that drive medical therapies, business decisions, insurance, and the amelioration of climate change. English professors use latent Dirichlet allocation to identify themes in literature. Philosophy faculty study the implications of Bayes' Rule for rationality and coherence. Chemists, entomologists and historians all employ statistics on a regular basis, either on their own or through collaboration with research statisticians. – David Banks, Duke University Statistics Department, ASA Fellow, IMS Fellow, AAAS Fellow

While biostatistics departments are generally composed of individuals who assist medical schools with clinical trials, survival analyses, and causal inference, statistics departments typically have experts in experimental design relevant to important programs across campus. At UNL, that would include agricultural field experiments, population genetics for plants and animals, engineering factorial experiments and quality control, survey sampling to support social science, statistical computing and simulation, Bayesian methodology, and operations research.

A centralized statistics department that is set up to collaborate with quantitative disciplines on campus is more efficient than a distributed set of statisticians scattered across many different departments, because it is easier to find the statistician with the right expertise when they are co-located. Under a distributed model, someone might have to search directory information within 12-15 departments[1], and it is likely that they may not find the right person in any case. Figure 7.1 and Figure 7.2 demonstrate the number of

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[1]As we have tried to do when assembling this report – it is not an easy or efficient process.

connections necessary to find the right statistical expertise under both the centralized and decentralized models.

> A centralized Statistics Department provides essential consulting, collaboration, and training for research across all colleges. Dispersing faculty into a "distributed model" weakens this role and undermines interdisciplinary strength. – Brani Vidakovic, H.O. Hartley Chair and Department Head, Department of Statistics, Texas A&M University

Decentralized statisticians also exist in a service role, publishing research papers that may develop their disciplines but which often do not make contributions to the discipline of statistics.

> **ℹ Example: Statistics Research Products under a Centralized Model**
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> As an example, the charts and graphs used to show the metrics of each UNL department were created with `ggplot2`, `plotly` and `knitr`, all tools developed at Iowa State under the supervision of Dr. Heike Hofmann, who is now in the UNL Statistics department.
>
> It is hard to imagine such tools being developed under a distributed model: they are the product of statistics research, and they are now widely used across quantitative disciplines. Similarly, tools like `rmarkdown` and `quarto` (which were used to assemble the charts into a document that was shared across the university) are direct descendants of research products of the Iowa State Statistics department in the same era, and they are now gold-standard tools for reproducible research across the sciences, in addition to making reporting easier within e.g. business and administrative units. Within UNL, these tools are used in agronomy, agricultural economics, biosystems engineering, the School of Natural Resources, journalism, and psychology[2].

Collaboration between statisticians produces research that makes science better and more efficient for everyone, but this is difficult or impossible to prioritize under a distributed or service model where embedded statisticians are evaluated based on discipline-specific contributions.

We can also evaluate the purported efficiency of a distributed model by examining the resources currently available across the NU system in Statistics. If there is excess capacity of faculty with statistical expertise outside the Statistics department, then perhaps the inefficiencies of the distributed model would be countered by the savings from eliminating the department. However, this is not the case, as demonstrated in the next section.

3.3 NU System Statistics Expertise

There are several units within UNL that maintain some statistical expertise in-house, in addition to programs in Biostatistics at UNMC and Statistics and Data Science at UNO.

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[2]This is only a partial list assembled from members of the R User Group on campus and other collaborators – there may well be others.

At UNL, in addition to the Statistics department, some departments have overlap with Statistics in coursework and/or research:

- the Quantitative, Qualitative, and Psychometrics (QQPM) department, which focuses on educational statistics and measurement. None of the faculty have Ph.D.s in Statistics; they are distributed between QQPM, Educational Psychology, and Psychology programs. However, they clearly have expertise in some aspects of statistics and measurement.
- the Psychology department has a quantitative emphasis for their Ph.D. program.
- the Sociology department has two faculty (Kristen Olson, Jolene Smyth) who specialize in survey research methods. Their Ph.D.s are in Survey Methodology and Sociology, but they do survey research and have expertise that isn't currently available within the Statistics department.
- the Economics department. Econometrics has some overlap with Statistics. There are three faculty (Yifan Gong, Christopher Mann, Federico Zincenko) who mention Econometrics as a research area within this department.
- the Agricultural Economics department. There is some overlap with statistics in discipline, but it is difficult to identify any specific faculty who might have the expertise and interest to do Statistics work. None of the faculty appear to have Ph.D.s in Statistics.
- the Actuarial Science program. Three tenured or tenure-track faculty (Colin Ramsay, Mostafa Mashayekhi, Graham Liu) affiliated with Actuarial Science have Ph.D.s in Statistics or Actuarial Science.
- the Supply Chain Management & Analytics program. None of the faculty have Ph.D.s in Statistics, but seven tenured or tenure-track faculty have degrees in business analytics, operations management, or supply chain management. These degrees are not comparable to statistics in terms of theoretical training that would support development of new statistical methodology but might suffice to cover some of the coursework currently offered in the Statistics department.

Chapter 4 discusses the ways that the Statistics department interacts with other portions of campus. Faculty within the College of Business (Econometrics, Actuarial Science, Supply Chain Management & Analytics) represent perhaps the closest group outside of the Statistics department within UNL, but none have degrees in Statistics, and while some of the courses taught in the College of Business may touch on topics such as forecasting, simulation, and modeling, the faculty within the college have specialized to apply these techniques to business and finance, and it seems unlikely that they have extra capacity.

Ultimately, however, there are clearly insufficient FTEs available at UNL in statistics-adjacent fields that could reasonably take over the teaching, collaboration, consulting, and research functions which are fulfilled by the Department of Statistics, particularly when the existing demands on those FTEs are considered.

> As a tenured Professor and Associate Chair of the Statistics Department at Cornell University, I've seen firsthand that the belief that data science programs can replace the foundational role of statistics departments is not just misguided, it's fundamentally flawed. While data science is a valuable and growing field, it is built upon the theoretical and methodological foundations

developed within statistics. Data science programs rely on statistics departments for core instruction in probability, inference, modeling, and experimental design. Without a dedicated statistics faculty, data science curricula risk becoming superficial, lacking the depth and rigor necessary for high-quality research and decision-making. Moreover, statistics departments are essential for advancing the theoretical underpinnings of data science itself, ensuring that innovation in machine learning, causal inference, risk assessment, and uncertainty quantification is grounded in sound methodology. – David Matterson, Director, National Institute of Statistical Sciences

The Biostatistics department at UNMC has sixteen faculty members, and of these, fourteen have Ph.D.s in Statistics rather than Biostatistics; the remaining individuals received their Ph.D.s from UNMC in Biostatistics and Biomedical Informatics. Moreover, five of the sixteen tenured or tenure-track faculty received their Ph.D. in Statistics at UNL[3] (see Table A.1 for a full list), an indication that the Statistics department at UNL actually serves to enrich Biostats at UNMC, rather than being a redundancy within the UN system. While Biostatisticians at UNMC do valuable work that contributes to research methodology in statistics, many of the papers listed in different research areas were published before the faculty member joined UNMC - that is, the broader methodological papers were written as part of their doctoral work in Statistics.

More generally, statisticians are an important component of a research university: statisticians not only do their own research (in forensics or data visualisation, for example); they improve other people's research. I am aware your institution has a Biostatistics department, but statisticians (like everyone else) specialise – they will typically not have the expertise to support research areas where the Statistics department specialises, even if they have the spare capacity. – Dr. Thomas Lumley, Chair of Biostatistics, University of Auckland

Biostatisticians apply statistical methods to medicine, and must cultivate a specific set of skills for collaborating with doctors that are distinct from collaboration skills required for working with other academic disciplines. A Biostatistics department is not sufficient to serve as the center of a statistical practice that supports the many non-medical disciplines that are important to the state of Nebraska: agriculture, animal science, population genetics (animal and plant), engineering, social sciences, education, business, physics, chemistry, and biology. In addition, Table 4.2 shows that UNMC already utilizes the SC3L (or did, until policy changed so that only IANR clients can access free statistical consulting). This suggests that UNMC Biostats does not have the excess capacity to help fill statistical needs at UNL. Chapter 5 includes a discussion of peer R1 and AAU institutions, many of whom maintain both statistics and biostatistics departments.

There is also a Mathematics department at UNO which offers statistics coursework and a data science program. Of the 18 tenured and tenure-track faculty in this department, there are three with statistics Ph.D.s (see Table A.2 for a full list). UNO is not an R1 university, and faculty there have a much

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[3]Technically, one of these Ph.D.s was issued by the Department of Mathematics and Statistics before the formation of the Statistics department.

heavier teaching load than faculty at UNL; consequently, it stands to reason that the UNO Mathematics department would not be able to significantly alleviate the statistics need across the university that would be created through the proposed elimination of the Statistics department in favor of a distributed model.

The University of Nebraska - Kearney has a mathematics and statistics department which does not appear to contain any statisticians, according to the research interests listed on the faculty web pages. Moreover, as UNK does not have a statistics program at any level, it stands to reason that UNK Mathematics & Statistics faculty will not be able to help UNL with its proposal to use a distributed model for the university's statistics instruction, collaboration, consulting, and research needs.

> For UNL to "unilaterally disarm" and drop statistical thinking from its teaching, research, and service missions would do an enormous disservice to the state, and ultimately be counterproductive for UNL. – Brad Carlin, UNL Math & Statistics alumni, former faculty at CMU and University of Minnesota Statistics, President of Biostatistical Consulting

4 Metrics

We begin this section by acknowledging that it is *hard* to assemble fully correct data that correctly represents our department, and that the task to assemble all of the (correct) data for all departments and stand-alone programs on campus is indeed a difficult one. We teach several courses in our department which describe how to build a data pipeline, from collection to cleaning to visualization, and we believe having a resource on campus which can consult on these tasks is fundamentally important to both the research and administration of the university. Our students are taught to consider the impact of the decisions which are made during assembly of a data pipeline when conducting the resulting statistical analysis and whether numbers are comparable and not an instance of "apples" to "oranges"; it is this step that is most obviously missing from the metrics provided to APC to justify the budget reduction plan.

The department would be more than happy to assist with future projects evaluating the performance of units across campus; integrating the methodology and data into a course as a service learning opportunity would have very real benefits. This data is both extremely interesting and provides an excellent demonstration of the importance of a variety of concepts from data documentation to reproducibility and the different varieties of messy data which often appear in real-world analyses.

However, we would be remiss if we did not note that administration has access to resources which have not been made available to departments seeking to understand how the relevant metrics were assembled. Ultimately, these issues are not particularly relevant to the importance of the Statistics department within the University of Nebraska ecosystem, and so we will defer discussion of most of the issues[1] to Appendix B, which documents issues with the data itself, and Appendix C, which documents issues with the way variables were assembled and calculated.

> **Evaluation Metrics.** As a social scientist who regularly constructs and evaluates composite indicators, I am dismayed by the metrics being used to evaluate programs during this budget reduction process. These metrics are inherently and irreparably flawed in their conceptualization, operationalization, and measurement. The inconsistent time frames across individual variables, the lack of weighting for different indicators, and discrepancies in the underlying data are just a few of the problems plaguing these metrics. These data are inadequate and misleading and should not be used for such high-stakes purposes, or, frankly, for any purpose.
> Furthermore, this process has failed to engage experts on campus in identifying the individual

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[1]Not all identified issues are outlined in those sections, because our priority is in preserving our programs and department rather than engaging in pedantry. We have opted to save resources and only detail the worst offenses in the data analysis which resulted in our unit being targeted for elimination.

metrics, operationalizing the variables, constructing the composite indicators, gathering the data, and analyzing and drawing conclusions from the data. This failure or unwillingness to engage with campus experts, including, most notably, faculty in the Department of Statistics who are now at risk of losing their jobs, is negligent. We all would take care to remember that quantitative metrics, if poorly conceived, are neither neutral nor "strategic."… I encourage members of the APC and the Office of the Chancellor to draft and seek solutions that rely on accurate and well-conceived data, minimize disruptions to students' degree completion and faculty members' career paths, and ultimately break us out of this vicious cycle of continued budget reductions. – Courtney Hillebrecht, Ph.D., Chair and Professor, Department of Political Science

4.1 Research

We start by acknowledging that clearly, quantitative measures were important in the decision to propose the elimination of our department. However, that is not the only way to measure research effectiveness.

In my current work with Prof. Jennifer Clarke on an international project testing a phenotyping tool PlantEye from Phenospex campany for precision agriculture, I lead experimental design, training, and data collection, while Prof. Clarke will apply advanced statistical models to analyze the results. I have come to realize that working without expert statisticians is like trying to navigate a ship without a compass - the data may exist, but the path to meaningful conclusions is lost. Losing the Department of Statistics faculty would not only hinder these critical analyses but could compromise international collaborations and the opportunity to bring advanced phenotyping system to UNL, as the strength of these partnerships relies on statistical expertise. Beyond direct research collaborations, the departmental seminars have been invaluable for me as non-statisticians, providing the knowledge and confidence to apply statistical methods in my research and strengthen grant proposals. – Dr. Seema Sahay, Center for Plant Science Innovation

The Scholarly Research Index (SRI) is a measure developed by Academic Analytics to evaluate the research performance of individuals and entities with respect to (1) scholarly products, such as conference proceedings, research articles, books, and book chapters, (2) recognition from the community in form of citations and awards, and (3) federal sponsoring of research projects measured by the number of grants and their amounts.

Different disciplines operate differently. The weighting of each of these measures is discipline specific (based on a factor analysis by Academic Analytics); the weights for statistics are shown in Table 4.1.

Table 4.1: Academic Analytics weights used to evaluate statistics department research performance and impact.

Category	Weight
Articles	18
Awards	19
Books	5
Chapters	5
Citations	20
Conf Procs	11
Grant $	22
Patents	0
Trials	0
Total	**100**

UNL Statistics has (based on data through December 2023) an SRI of 0.4 based on all R1 and R2 institutions tracked by Academic Analytics. Academic Analytics also offers the ability to compute an SRI based on a custom comparison group; using only AAU universities, the department's custom SRI is -0.1.

Importantly, however, because SRI is the result of discipline-specific weights, it **cannot** be used as a faithful performance measure across disciplines directly. Each discipline has different distributional parameters (mean and standard deviation) for the SRI values. Comparing across disciplines without accounting for these distributional differences is not only incorrect but extremely misleading. Academic Analytics stresses the importance of using the SRI (and any other metric) only for comparisons within taxonomy peers. This is violated two-fold with the metrics used in the performance across units: departments are not at the same taxonomy level as stand-alone programs; and 'peers' are defined discipline specific. The document further elaborates the method for aggregating faculty within units. The key step here is to "Calculate each faculty member's rank within the taxonomy, for each metric". The discipline specific SRI rank is directly related to the SRI percentile.

Figure 4.1 shows the SRI percentile for each department on campus when compared to other R1 and R2 departments. While several departments which have been proposed to be eliminated are indeed performing below the median, many departments are also above-average in their respective fields. We teach statistics students to carefully consider the appropriate comparison population and the real-world meaning of the numbers they use in analyses; it is important that UNL's administration does the same. After all, it is less important that Statistics publishes the same amount of papers or generates the same amount of grant funding as Physics, because grants in those fields cover different things (statisticians don't need particle accelerators very frequently) and publication norms are also different. What matters is whether departments are doing good work as measured by comparisons to the appropriate peers, both actual and aspirational.

Units at UNL ranked by SRI Percentile compared to all Academic Analytics peers
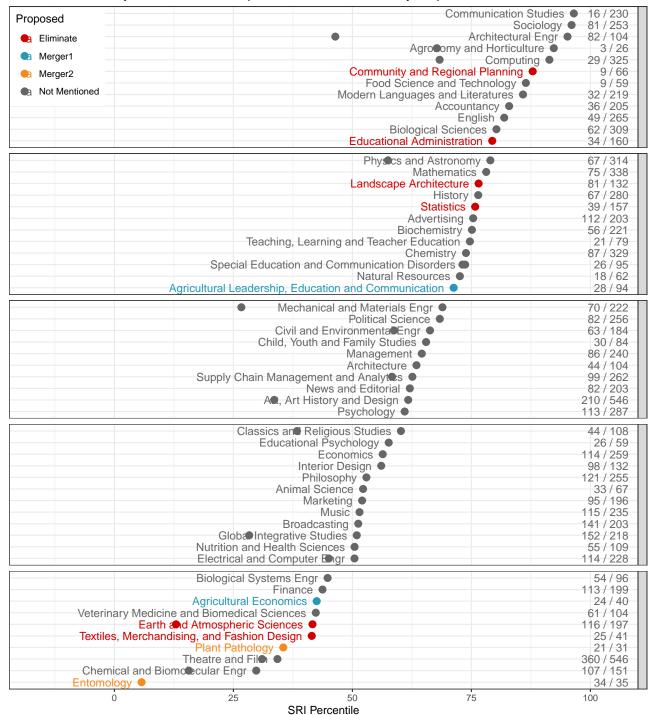
Figure 4.1: UNL Units ranked by SRI percentile compared to peer departments in Academic Analytics. Points are colored by the budget proposal status. Some of the departments proposed to be eliminated are extremely well ranked. Where two SRI percentiles are provided (indicating different fields or different types of departments), the higher percentile is used for the ranking.

UNL's ranking indicates that the Statistics department's research productivity and recognition is better than 75% of other R1 and R2 institutions. Comparing the Statistics department's SRI to other Statistics departments (Figure 4.2), it is clear that the UNL Statistics department performs better than several well-respected AAU and Big Ten institutions. If the Statistics department is eliminated, it is likely to hurt UNL's case to be readmitted to the AAU, even though our SRI is below the mean for AAU institutions, because we are performing within the range expected of statistics departments at AAU institutions.

> [Y]our statistics department is punching above its weight. Bertrand and Jennifer Clarke have written the bible on predictive statistics. When Covid-19 was at its height, Chris Bilder was advising the state of Nebraska on group testing, and his methodology was used. Bhaskar Bhattacharya has published seminal work in the Annals of Statistics, which is Holy Grail of mathematical statistics. Erin Blankenship is one of the world leaders in agricultural statistics. Heike Hofmann was recently hired from Iowa State, and she is a Fellow of the American Statistical Association, and there are several others in your department who outshine even her. – David Banks, Duke University Statistics Department, ASA Fellow, IMS Fellow, AAAS Fellow

What is remarkable is that UNL does all of this with a department that is very small relative to its peers, as shown in Figure 4.3. It should be noted that UNL offers a full complement of statistics degrees and supports the data science program with this small faculty (13 tenure-track professors and a 30% FTE teaching professor of practice) while keeping research productivity high.
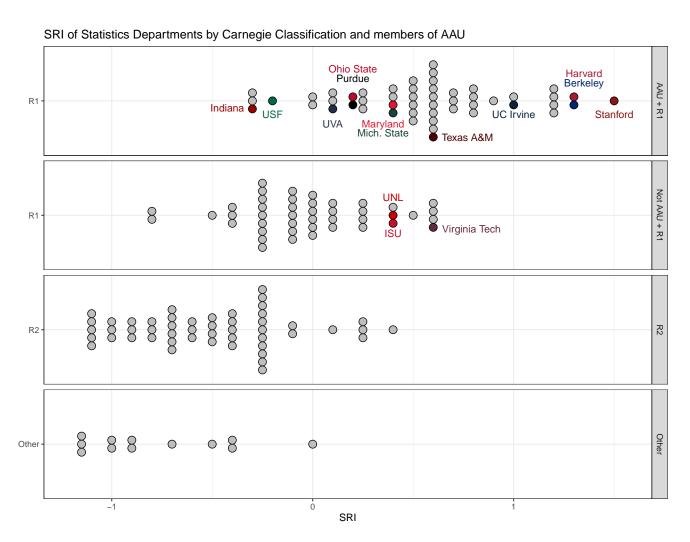
Figure 4.2: Research performance (SRI percentile) of units by classification. UNL is performing extremely well compared to its peers and has better performance than many AAU institutions.
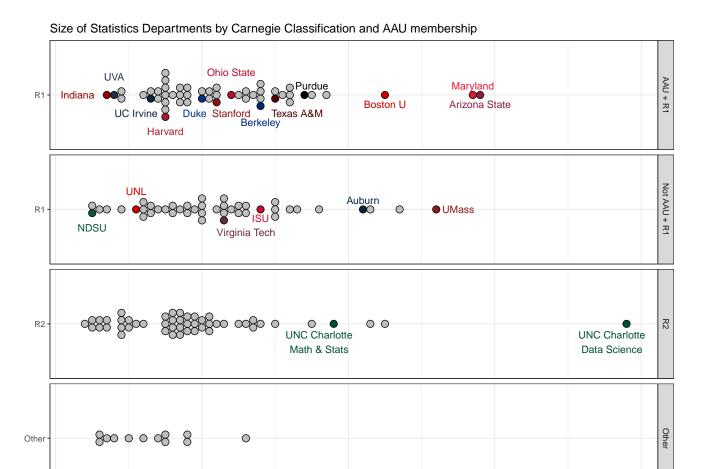
Figure 4.3: Size of Statistics-related Units at each institution. UNL is managing to handle all of its BS, MS, and PhD programs within a department that is extremely small relative to peer institutions at both R1 and AAU institutions.

A central development in scientific publishing and scientific procedure over the last century has been the onset of data rich studies and the deployment of concepts and tools involving rigorous statistical methodology for data analysis. These concepts and tools have largely been invented, carried out, promoted, and taught in statistics departments nationwide and worldwide. Today there are hundreds of thousands of papers yearly in clinical medicine and computational science that publish their results and clinch their arguments with statistical tests and procedures.

Although rigorous methods are demanding, difficult and in certain senses forbidding, they

bring great benefits in terms of research efficiency. Instead of inconclusive research, in which we have no confidence, we get actual conclusions in which we have confidence. Still, some non-statisticians who have not been trained in these concepts and methods may not be aware of the threats to scientific validity which arise if the rigor is allowed to slip away. In fact, in the last decade we have become able to peruse the entire body of scientific literature as a dataset, and to recognize the uneven quality and rigor of studies, as well as the proliferation of poor studies, which contaminate the corpus and now begin to undermine public confidence and funding. – David Donoho, Professor of Statistics, Stanford University

4.2 Teaching

I strongly urge the Academic Planning Committee to … recognize that statistical education is not a "service" add-on but a foundational element in many academic disciplines, and a strategic asset for UNL and the State. – Professor Aemal Khattack, Civil and Electrical Engineering, UNL. Director, Mid-American Transportation Center

The Statistics department has high-SCH service courses, which the budget proposal recognizes and plans to continue. However, it is not clear how these courses will be taught - currently, they are taught by a combination of graduate students with training in statistics pedagogy and tenure-track faculty. The 1993 Biometry APR Self Study (pg 29) documented the challenges of appropriately staffing e.g. 801 and 802 labs when motivating their desire to start a Ph.D. program:

Enhanced teaching. Biometry has a number of classes with labs. We are constantly struggling to place graduate students with an appropriate background as lab instructors. For example, our M.S. students are required to take BIOM 802 (Experimental Design), which has a lab. They cannot teach the lab until they have had the course themselves… In general, Ph.D. level graduate students can make a variety of contributions to the teaching program that faculty do not have the time to make and M.S. students lack the background to make.

Section 8.2 estimates that at least 3 PoP positions would be required to maintain the 15 sections of 80 students in Stat 218 and additional sections of Stat 380, 801, 802, and 870 which would be maintained in the IANR proposal (approximately 25 sections per year). Keeping the sections of 318, 462, and 463 necessary to fulfill requirements in engineering and actuarial science programs would likely require an additional PoP, for a total of 4. Thus, the savings from the elimination of the statistics department are actually not nearly as high as expected: 4 FTE are required for teaching and 2 FTE are required for maintaining the SC3L, for a net of 7 FTE savings under the more specific details released by IANR on September 12.

Stat 218, 380, 801, and 802 regularly benefit from statistical research (for instance, an experiential learning activity in Stat 218 is used to introduce data visualization topics to students), and these benefits would disappear if all statistics coursework was offered by teaching-only professors of practice. However, this

is not the only problem. Eliminating the many graduate courses we offer to both statistics and outside students would hurt researchers and graduate programs across the university.

> Due to the development of specialized experimental designs in agriculture, we can rigorously analyze both field and greenhouse data to extract the most relevant and significant conclusions from our data. With the rise of large data sets, training in multivariate statistics has become essential. I cannot imagine a student of mine who is not trained in the statistical analysis of data. Statistical training has been an integral component for all students in my laboratory. Statistical analysis is a fundamental skill that every scientist needs to understand, both in academia and industry. – Dr. Daniel Schachtman, Center for Plant Sciences Innovation

> The training that my students receive from the statistics faculty is essential for the design of experiments and evaluation of the significance of the result. It is the foundation to advance our knowledge of plant science that is the basis to improve agriculture production. Consequently, eliminating statistic department severely compromises our research competence that benefits Nebraska agriculture production. – Dr. Bin Yu, Center for Plant Sciences Innovation

Ultimately, the department's teaching metrics are not representative of recent changes we have made in order to be more efficient and open our general education courses up to more students.

- We have recently increased class sizes for Stat 218 from 30-45 students to 80 students per section. This change reduced the number of GTAs from 24 to 20, producing savings of approximately $200k. These changes were made in response to requests from IANR leadership as well as a desire to increase efficiency, but the change took time to implement: we had to work with scheduling on City campus to reserve larger lecture halls that are not as common on East campus. As a result, none of these changes are reflected in the metrics because data after 2024 is not included. Ultimately, our ability to increase instructional efficiency more is limited by the availability of large lecture halls that can accommodate 150+ students.

- We began offering Stat 801 and 802 online in order to better support outstate students in various IANR programs, but this new modality has not been available for long enough to change enrollment metrics.

We also have great potential to open up and advertise other courses to departments across campus: Stat 850 and Stat 870 are both courses that should appeal to graduate students in many programs. In addition, it is quite likely that the number of SDAN majors will increase over the next several years, as we graduate our first cohort and have the ability to advertise their

> Over the course of my education, I studied at multiple universities, but UNL was different. The Statistics Department stood out for its supportive faculty who invested in my growth as a researcher and professional. In particular, my advisor, Prof. Ghosh, provided mentorship and encouragement that shaped my life in ways no other institution did. I also want to acknowledge the immense support I received from UNL during the COVID-19 pandemic. That sense of care

and community left a lasting impression on me and made me proud to be part of UNL. –
Ramesh Aravind, Ph.D., UNL Statistics. Data Scientist, Travelers Insurance.

Current students in other disciplines recognize the importance of the department to both their education
and their research.

As a PhD student in another department, I am disheartened by the committee's recommendation to eliminate the Department of Statistics and I urge the committee to reconsider. The department plays an integral role in graduate-level education across disciplines. Elimination of the department means limiting enrollment options for students seeking to learn from statistics experts, while placing undue strain on the faculty who teach related coursework in applied disciplines. Further, the Department of Statistics actively supports the research interests of the university as a whole through direct instruction, extension, outreach, and consulting. For me, personally, the resources and support offered by the department have been indispensable as I work toward becoming an independent researcher in my field who is sufficiently versed in statistical analysis methods to conduct high-quality investigations. My work would not be as analytically rigorous without the guidance and teaching provided by the department, and I am certain this is true for other graduate students and faculty alike. UNL's research activity, ability to attain grant funding via a variety of mechanisms, graduate student recruitment, and graduate level education standards will be dramatically impacted if the committee chooses to eliminate the Department of Statistics. – Caitlin Cloud, Doctoral Student, Sensorimotor Integration for Swallowing and Communication Laboratory, Department of Special Education and Communication Disorders

4.3 Consulting

In 1957, the seeds of the Statistics Department were planted with the founding of the Statistical Laboratory, which would provide statistical computing and consulting services to IANR. The consulting mission of the laboratory motivated the creation of the MS program in Biometry and the Ph.D. program in Statistics so that the department could meet more of the demand for statistical consultation and assistance with experimental design and statistical computing tasks.

...advanced graduate students can do routine statistical consulting on their own. This improves everybody's access to statistical consulting and frees the faculty to concentrate on more difficult consulting problems. In Spring semester, 1993, Biometry instituted a "Help Desk" staffed by a graduate student. The response has been very good; she has been very busy with a variety of problems. - 1993 Biometry APR Self-Study, pg 29

It is important to note that even in 1993, it was clear that the 8 tenured or tenure-track faculty in Biometry could not meet the demand within IANR for statistical consulting.

Yet the demand for statistical consulting and collaborative research is extensive at IANR. Any compromise in the quality of service provided by Biometry would translate as an immediate loss in the quality and quantity of research possible at IANR. - 1993 Biometry APR Self-Study, pg 34

The current proposal maintains 1 FTE of the current 13 FTE in the Statistics department, which is well below even 1957 levels of funding and support.

Table 4.2: SC3L clients, 2020-2025. The SC3L is essential for research in departments across campus, but also has worked with clients from UNMC (teal) and UNK (gold), as well as local organizations, such as Southwest Fire & Rescue. Ultimately, the entire university system would be hurt by the proposal to eliminate the Statistics department, because the SC3L is staffed by statistics graduate students. One supervisor cannot reasonably perform the consulting tasks currently handled by 5 students working 20+ hours a week.

Department	2020	2021	2022	2023	2024	2025	Total
Agricultural Economics	1	1	2	2	1	2	9
Agricultural Leadership, Education and Communication	1	1	1		2	2	7
Agronomy and Horticulture	18	33	31	19	18	13	132
Animal Science	11	7	18	13	12	17	78
Athletics			1				1
Biochemistry	2				1	1	4
Biological Systems Engineering	2	8	6	13	6	2	37
Biology	1				1		2
Biotechnology						3	3
Birth Outcomes and Water Research	3						3
CAS		1			1		2
CEHS				1			1
Chemistry					2		2
Civil and Environmental Engineering			1	5	3	1	10
Communication Studies	1	2				1	4
Computer Science and Engineering	2	1	1				4
Criminology and Criminal Justice			1				1
CYAF			1				1
Dental Hygiene	24	19	18	15	15	14	105
Earth & Atmospheric Sciences	3	1		2			6
EDPS		1	2			1	4
Education		1					1

English				1			1
Entomology	14	27	18	16	8	6	89
Environmental and Sustainability Studies		3		3	1	1	8
Food Science and Technology	19	14	19	18	16	9	95
Glenn Korff School of Music		3	1	1	1		6
Growth & Development	2	1					3
Marketing	1						1
Mathematics				4	1		5
Mechanical	1	3				1	5
Music - Vocal Pedagogy		1					1
National Drought Mitigation Center			1				1
Nebraska Forest Service					1		1
NeDNR - Water Planning Division				1			1
Neurocarrus		1					1
Nutrition and Health Sciences					1	1	2
Office of Academic and Student Affairs		1					1
Office of Research			1				1
Oral Radiology				1			1
Panhandle Research and Extension Center	1				1		2
Philosophy		1					1
Physics		1					1
Plant Pathology	2	2	4	7	2	2	19
Political Science				1			1
Psychology		1	1				2
Public Policy Center		1					1
School of Biological Sciences		1	5	1	1	2	10
School of Natural Resources	9	7	6	18	5	8	53
SGIS-Anthropology		1					1
Sociology				2			2
Southwest Fire and Rescue			1				1
SVBMS	1	4	5	1	2	3	16
Testing Center				4			4
Textile Science						1	1
TLTE				1		1	2
University Libraries		1		1	2	1	5
UNK Communication	1						1
UNMC	1	4	7	3	1	3	19

As Table 4.2 shows, the SC3L handles a large number of projects over the course of a single year. Many of these projects are graduate research in other departments, and result in publications which only sometimes include the SC3L consultant and only rarely include any Statistics faculty. **These contributions to the research activity across the university and system are simply not counted in the metrics**, as graduate student papers are not counted in the department's metrics.

Moreover, Kathy Hanford, the head of the SC3L until her retirement in 2023, had a Professor of Practice position, which means her research outputs are not counted in the department's contributions, both because she was not in a tenure-track position, and because she retired in December 2023 and was thus not in the department when the data were assembled.

Currently, the SC3L employs five graduate students for 20 hours a week each, though they generally work on SC3L projects more than the 20 hours/week required by their funding. There is no way that the single FTE dedicated to the SC3L under the current budget can manage this workload. In addition, under new rules imposed by IANR, this 100 hours per week (plus the SC3L director's time) is devoted only to IANR projects. The demand for consulting services in other colleges and units is surely much higher! Chapter 9 discusses possible resolutions for the mismatch between IANR interests and the ability for all researchers at UNL to access statistical consulting services.

> Historians have looked into the practice of statistical data analysis during that earlier era. For example, Stephen Stigler of University of Chicago has an excellent article called "The History of Statistics in 1933". He showed that in those days there were earnest and hard-working data analysts who were not schooled in the kinds of patterns one might see in noisy data that had explainable causes recurring again and again from study to study. Instead, there was a great deal of wasted time and effort in those days, when people just didn't understand what they were seeing. They either thought they were seeing something real that was only an artifact, or they were ignoring patterns and tendencies that were fundamental and very important but were overlooked through lack of the right tools or simple awareness. – David Donoho, Professor of Statistics, Stanford University

That our graduate students are the primary point of contact for many consulting projects hides quite a bit of collaborative and consulting work from the UNL metrics - often, it is the students who are co-authors on papers, and they do not show up in Academic Analytics. The plant pathology department (quickly aided by other departments on campus) set up a survey to demonstrate how many collaborations may not be present in the metrics; a spreadsheet with results can be found here. Without the graduate students supported by the SC3L, UNL risks publishing studies which are the product of faulty statistical analysis, or which employ sub-optimal experimental designs. This will slowly erode the reputation of other departments on campus, and will make UNL less competitive for federal funding.

Ultimately, reducing the consulting resources on campus threatens the ability of UNL to maintain its status as a Big Ten, land-grant, AAU-aspiring R1 university.

4.4 Collaboration

The Statistics department at UNL is currently well connected with other entities across UNL, mostly units on East Campus. Figure 4.4 shows a network of collaborations as recorded by Academic Analytics.
What is missing from this view are any collaborations with members of the Statistics Department who were not included in Academic Analytics by an oversight of the UNL administration. Faculty (Hanford, Stanke, Clarke) might not have a research component in Statistics, but their professional practice in Statistics enables researchers across campus to do their research.
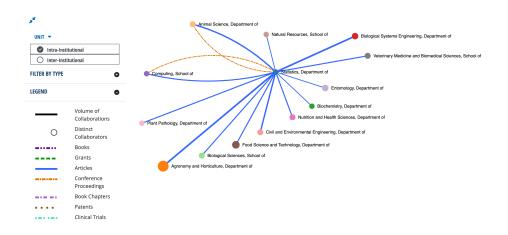
Figure 4.4: Network of collaborations by the members of the UNL Statistics Department with other units across UNL.

The number of grants might seem low, but only grants with a non-zero dollar contribution to a Statistics faculty member are included. The mission of the Statistics Department has been to first and foremost serve the institution. As such we have agreed to be involved in grants without being officially acknowledged by receiving a non-zero percentage of the incentive, and in some cases, we are not even formally listed on the grants. Statistics faculty are also often involved by advising joint students, which is not documented in any of the metrics, though presumably that data is available to administration.

> The Cultivate ACCESS team successfully secured $750,000 in USDA funding, in part because of the strength Erin [Blankenship] brought to our proposals through her nationally recognized expertise in data science and statistics education.

Eliminating the Department of Statistics would have profound consequences for programs like ours. Without a home department, the university risks losing faculty who bring both technical knowledge and the ability to bridge disciplines. Erin's work demonstrates the irreplaceable value of Statistics to interdisciplinary collaborations that directly serve students, strengthen teacher preparation, and enhance the university's research and outreach mission.

We strongly urge you to preserve the Department of Statistics. Doing so ensures that the university can continue to deliver the kinds of student outcomes and external partnerships that are central to AAU priorities and to the university's future success. – Cultivate ACCESS Leadership Team

Some of our department members have been told that the research done in statistics – that is, the research published in statistics journals, rather than domain journals – is no longer considered "in alignment" with IANR and possibly UNL strategic goals. There is a faulty assumption at the core of this idea – there is not a clear divide between statistics research and domain-specific consulting. The two co-evolve, as Statistics research is often the product of domain specific questions. There is a cross-pollination effect whereby consulting projects raise statistics questions that are more abstract, leading to a split where the domain-level project is solved first and the more abstract problem is solved later and published in Statistics. Then, the formal methodology in the statistics literature can be applied to other domains with similar problems and slight variations. This admittedly complex process takes time to bear fruit, which is why consulting relationships take time to build and evolve.

The Department of Statistics is not an isolated entity; it is an indispensable partner for us and for many other departments on campus. … **Instrumental for Research and Funding** The success of our research and our ability to secure external funding are directly tied to the expertise of the Statistics department. Our faculty members have relied on this partnership to secure significant external grants, including multiple projects funded by the National Science Foundation (NSF). This is not a coincidence. Modern plant science is a data-intensive discipline, and robust statistical analysis is essential for designing experiments, interpreting complex datasets, and validating research findings. Without in-house statistical collaboration, our faculty's ability to compete for large-scale federal funding—like that from the National Science Foundation (NSF)—would be severely diminished.

The department's value extends beyond formal collaboration. The department is essential to the education of our STEM undergraduates and graduate students, as well as informal mentorship and collaboration that are vital for both new and established faculty. Dr. Nathan Butler: "I have not had the opportunity to formally collaborate with stats faculty but have had useful in-person conversations with Susan VanderPlas and Dixon Vimalajeewa towards addressing research problems I'm interested in as a new faculty member, Erin Blankenship for providing an essential course (STAT 801) for my first graduate student, and Jennifer Clarke for recruiting me to UNL as the Director of the Quantitative Life Science Initiative." – Center for Plant Science Innovation

There is the perception that collaborations across units have suffered from the recent retirement of highly-collaborative faculty. The administration has (informally) expressed a wish to see more collaborations within the Statistics Department, and while we are cognizant of this, collaborations take time to build before any measurable outcomes (papers, grants, students) can be documented. There is always a replacement cycle in any ecosystem, and while it is true that some old-growth trees have recently fallen, there are many saplings growing quickly to take their place in the forest. All of the metrics used to analyze the department are **lagging indicators** – the work is done more than a year before the paper is officially published[2] or the grant is submitted, and then there is another year or more before the product is officially documented by Academic Analytics.

UNL is large, and the East/City campus divide can make it difficult to find the right collaborators - while the UNL Statistics department has many people who are excellent in their niches, it can be hard for non-statisticians to determine which person has the right expertise for their project. It might be more effective for the administration to facilitate opportunities for new faculty to meet established researchers in other departments - "speed dating for statisticians?" to set up the right conditions for these interdisciplinary collaborations to grow and mature. Alternately, a Statistics department with resources and additional capacity might host these events ourselves.

> With current staff and teaching commitments, any expansion of services is not reasonable. Any increase in one form of consulting or research activity will require either an increase in consulting resources or a reduction in some other activity. - 1993 Biometry APR Self-Study, pg 34

4.5 Economic and Social Impact

> In a recent reciprocal visit to OPS schools in Omaha, it was very apparent that STATISTICS interest is up in our K-12 students as many on a student panel spoke about their interest in having a career that involves statistics or data science. These students are correct in pursuing that interest as, future career opportunities in statistics and data science are expected to grow substantially across numerous industries, including healthcare, finance, and technology, driven by the increasing volume of data and the demand for data-driven decision-making. Key roles include Data Scientists, Statisticians, Operations Research Analysts, and Data Engineers, all requiring strong tech skills and specialized knowledge in areas like machine learning, AI, and big data. If we cut this department my question is where will Nebraskan students get an in-depth passionate education in Statistics and Data science? – Tammera Mittelstet, Ph.D., CASNR Statewide Education and Career Pathways Coordinator

Nebraska is a unique state in many ways, but it is not unique in the demand for statisticians, data scientists, and those with the quantitative skills necessary to build applications that support data-driven decision making across industries.

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[2]Some journals in Statistics have a backlog of 2-3 years after the paper is accepted before it appears in print!

Many state, local, and private sector organizations rely on well-trained statisticians: in transportation engineering, public health, agriculture, environmental modeling, economics, technology, social policy, etc. Eliminating the department weakens the workforce. The removal of this program would damage UNL's reputation: for research, for graduate education, for interdisciplinary collaboration. Stand-alone departments that anchor quantitative and analytical research are core to being a research university. – Professor Aemal Khattack, Civil and Electrical Engineering, UNL. Director, Mid-American Transportation Center

Hiring in statistics is robust in academia and in industry. The UNL statistics department helps meet the growing demand for data scientists and statisticians within Nebraska, but we were also surprised how many of our graduates work remotely and live in Nebraska, contributing to the local economy while working for large national companies. This serves a dual function that is important for the state – these students can live close to families and support aging parents while working high-paying jobs and paying state and local taxes accordingly.

From the student perspective, this department has been crucial to my academic growth, as well as that of my peers, both inside and outside the program. Before attending graduate school, I worked as a Business Intelligence Analyst in data analytics at Sandhills Global, one of Nebraska's major employers of UNL graduates. I left that full-time role to pursue a Master's in Statistics, seeking a stronger foundation in statistical theory and methods to prepare for a career as a Data Scientist on Sandhills' Research & Development team. Even after only a year in the program, I returned to Sandhills as a Data Science intern last summer and was able to make meaningful contributions. My training in Experimental Design, Linear Models, and Bayesian Statistics directly supported improvements to the internal AI-powered chatbots in Sandhills' Retrieval Augmented Generation pipeline. My coursework in Mathematical Statistics and Statistical Computing allowed me to build a Lead Quality Meter to classify sales leads as high, medium, or low quality, ultimately increasing sales and reducing time spent manually routing clients. Sandhills Global is just one of many examples of employers who have benefited from statistics graduates from UNL. Alumni from this department are working in key roles at First National Bank of Omaha, Mutual of Omaha, Hudl, Nelnet, and many other large companies, applying their statistical training in ways that strengthen Nebraska's economy. Recruiting outside talent to Nebraska is already difficult; it is therefore imperative to prepare in-state graduates with formal, rigorous statistical training. Since UNL houses the only dedicated Statistics Department in the state, eliminating it would force future students to leave Nebraska to study statistics and would weaken the state's ability to meet growing workforce demands in agriculture, healthcare, business, and technology. – Arian Alai, MS/Ph.D. student in Statistics

The demand for statistical training will only grow as AI becomes more prevalent, as AI is, fundamentally, a combination of linear models, trained on data. Statistics is a critical component of AI, and without statistical training, people risk misusing AI tools, with potentially disastrous consequences. It is critically important to Nebraska and also to UNL that we continue to train statisticians who can provide this expertise.

Furthermore, the decision to close a statistics department runs contrary to national and global academic trends. At a time when universities are expanding their quantitative programs to meet the explosive demand for data scientists and analysts, eliminating a strong and respected department is a shortsighted move. It is particularly important now, in the age of artificial intelligence, that students have a strong statistical foundation. Without it, they risk misusing AI tools for statistical analysis without truly understanding or being able to check the output, potentially leading to flawed research and even academic plagiarism. – Dr. Ladányi Márta, Professor, Hungarian University of Agriculture and Life Sciences, Institute of Mathematics and Basic Science

In addition to the economic consequences, there are also social impacts to eliminating a statistics department and its faculty. Our faculty are collaborators on a number of critical research and social projects around the university, including the Nebraska Food for Health Center, the Quantitative Life Sciences Institute, the Center for Plant Science Innovation, and a variety of Hatch projects. Moreover, Dr. Susan Vanderplas and Dr. Heike Hofmann are well known in forensic science for their efforts to assist public defenders with proper assessment of scientific support for forensic evidence as well as their efforts to develop new quantitative methods for assessing firearms evidence. Without a dedicated statistics department, it would not be possible to connect people needing assistance with statistics, from public defenders to plant geneticists, with the statistician that has the expertise to help solve the problem. These collaborations – many of them uncaptured by university metrics[3] – are another consequence of having an active, engaged, and connected statistics department within state land-grant universities like University of Nebraska.

You are all undoubtedly familiar with the phrase "lies, damned lies, and statistics" which highlights how armchair statisticians can torment numbers to any end imaginable. Every day in criminal courts across Nebraska, witnesses come to court confidently and unknowingly abusing statistics that can hurt innocent people. Many defense lawyers aren't yet even aware how this is happening, but **statisticians in your department are some of the first in the country to study and work to systematically right those wrongs.** That work is just the beginning, and many other deeply flawed forensic fields are rooted in the same amateur application of statistics. Please reconsider the proposal to eliminate your Statistics Department. An unchecked forensic industry's impact on the legal system is just one consequence of a society that doesn't value statistics. In our moment, when anyone can manufacture "facts" to be disseminated to the world with the click of a mouse, statistics are one of the last defenses of reality. The public desperately needs robust statistics departments. – Peter Conley, Deputy Capital Public Defender, Kansas Death Penalty Defense Unit

The statistics department at UNL has also been developing plans to improve statistical education across the state in K-12 education, in addition to fulfilling our research, teaching, extension, and service missions within the university.

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[3]Dr. Vanderplas has written legal briefs or consulted pro bono on for 11 cases across 10 jurisdictions since 2020, helping to overturn precedent for admissibility of forensic evidence on at least three occasions (legal proceedings move even slower than most peer review processes, so these collaborations take even more time to bear fruit).

In my role as CASNR Statewide Education and Career Pathways Coordinator I have witnessed first-hand this small but mighty department's vision for the future and preparation for the increase workforce needs in STATS and Data Science. Just two days prior to this proposed budget cut announcement I was sitting with the STATS department and the State Director of NJAS (Nebraska Junior Academy of Sciences) developing a plan for the creation and dissemination of basic statistics teaching modules to support the K-12 teachers and students across the state of Nebraska as they develop their statistical analysis for science fair projects; a need voiced by teachers, regional science fair directors, and science fair judges. We had a plan for implementation starting in December, that now must be paused due to this proposed budget cut.
– Tammera Mittelstet, Ph.D., CASNR Statewide Education and Career Pathways Coordinator

In both the measurable and difficult-to-measure components which could be used to evaluate a department, the UNL statistics department is excellent. We are productive in our own research and teaching, but we are also extremely collaborative, and our students and faculty also serve the wider university research mission by providing consulting services.

5 Peer Analysis

> The University of Nebraska-Lincoln's proposal to abolish its Department of Statistics and terminate all tenured and tenure-track faculty is a deeply alarming decision that threatens the integrity of a core STEM discipline. This move undermines the university's mission as a comprehensive, research-intensive, land-grant institution and contradicts the principles of academic excellence and innovation. – David Matterson, Director, National Institute of Statistical Sciences

There is an incredible diversity of both names and structures for housing statisticians within units across R1 and AAU universities, as touched on by Len Stefanski, former chair of the NCSU Statistics Department (the oldest and largest department in the country).

> That is why the news that UNL was considering abolishing Statistics came as such a shock. Especially, in light of the overwhelming and pervasive interest in Data Science, Data Analytics, and related areas. Statistics is The Science in Data Science. It is incomprehensible that any scientific organization would want to back away from Statistics at a time when so many are increasing their investment in Statistics. There are very few major universities that do not have departments of statistics or departments of mathematics and statistics (and the trend among the latter is to separate out statistics from mathematics as Wake Forest University has done very recently). Many major universities have both departments of statistics and departments of biostatistics. The presence of statistics departments at so many major universities is due to the fact that great research (in any discipline) is not possible without statistics. In addition to the impact of statistics on research of all types, the demand for students with degrees in Statistics (undergraduate and graduate) has never been stronger, and their career prospects have never been greater. – Leonard A. Stefanski, Professor, Department of Statistics, North Carolina State University

For the purposes of this analysis, there are two characteristics which seem to be particularly important:

- A group of statisticians located in the same department (whether that is called Statistics, Data Science, or Mathematics & Statistics), where
- The department offers programs in Statistics at the undergraduate or graduate level

We exclude from this "big tent" biostatistics departments, not because they don't serve a similar role, but because many universities have both Statistics and Biostatistics departments[1], and so we track Biostatistics as a separate (but closely related) discipline. Note that our approach differs from the Academic Analytics tracking of Statistics as a discipline, but the conclusions of this analysis are largely the same using either approach.

5.1 R1 Universities

Of the 186 R1 universities, only 1 does not have a stand-alone statistics, biostatistics, or data science department. If we exclude biostatistics, only 16 do not have a stand-alone statistics or data science department, and of these, 8 are medical schools which do not grant undergraduate degrees outside of the health sciences[2].

> Agencies such as NIH, NSF, USDA, and DOE expect a strong institutional presence in statistics when awarding large research grants. Eliminating the department will send a negative signal to funders, and the resulting shortfall in research funding will, over time, exceed the current budget savings.
>
> – Brani Vidakovic, Chair, Texas A&M and former Program Director, National Science Foundation

UNL Statistics ranks 27 of 86 R1 university statistics departments, or in the 69.77th percentile.

5.2 Land Grant Universities

> Every flagship university should have a strong and visible statistics department. Statistics is not only a standalone field but also a vital support system for nearly every discipline on campus. A dedicated department fosters innovation in theory and methodology, equips students with critical skills that are increasingly in demand across industries, and strengthens the university's ability to contribute to research that addresses society's most pressing challenges. Maintaining, supporting and further investing in a statistics department is a clear signal of a university's commitment to excellence, interdisciplinary collaboration, and leadership in a data-driven world.

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[1] The statistics department is typically on the main campus and the biostatistics department is typically located within the medical school organizational structure.

[2] R1 Universities offering non-medical undergraduate degrees without a Statistics or Data Science department: Boston College, CUNY Graduate School and University Center, Drexel University, Florida International University, University of Southern Mississippi, Brown University, Tulane University of Louisiana, University of Miami.

Medical institutions with only a biostatistics presence on campus: Baylor College of Medicine, Medical University of South Carolina, University of California San Francisco, University of Nebraska Medical Center, University of Tennessee Health Science Center, University of Texas Health Science Center at Houston, University of Texas Health Science Center at San Antonio, University of Texas Southwestern Medical Center

– Alexander Aue, Professor of Statistics, Program Director, Interdisciplinary Major in Data Science, UC Davis

If we instead consider our 48 land-grant peers, all 48 have a stand-alone statistics or data science department, and 27 also have a biostatistics department. That is, UNL would be alone among land-grant institutions if the proposed elimination of the Statistics department goes through. Statistics departments are essential for state flagship land-grant universities that drive the economic progress of the state through research and innovation in both theoretical and applied fields. We support research in departments across campus and fundamentally enable the university to fulfill the land-grant mission that was so central to our institution's founding.

> Disbanding Statistics would immediately weaken UNL's standing as a comprehensive, research-intensive institution. It would jeopardize collaborations across colleges, with federal agencies, industry, and other universities, and risk signaling a retreat from UNL's land-grant mission. – Thomas Lee, Distinguished Professor of Statistics, UC Davis

UNL Statistics ranks 15 of 40 land grant university statistics departments, or in the 65.00th percentile.

5.3 Big Ten Universities

> Eliminating the department would not only discredit UNL's national reputation but also dismantle a critical hub for collaboration, teaching, and discovery. Thirteen out of fourteen Big Ten universities maintain stand-alone statistics departments because they recognize the strategic importance of the discipline. As a proud statistics major from one of those institutions, I can personally attest to the transformative value of a dedicated statistics department in shaping my own education and career, and in fostering a culture of analytical rigor, interdisciplinary collaboration, and continuous innovation. UNL's decision would set a dangerous precedent in which foundational academic units can be dismantled despite their centrality to institutional success and societal progress. – David Matterson, Director, National Institute of Statistical Sciences

We should note that Dr. Matterson's statistics on Big Ten membership might be slightly out of date, but the conclusion is the same. Of the 18 Big Ten universities, only University of Oregon does not have a cluster of statisticians on campus, and they are actively hiring statisticians to fill a School of Data Science. Academic Analytics also does not have a SRI for University of Southern California, perhaps because they have a combined Mathematics & Statistics department. One additional university (Indiana) has proposed its Statistics department for elimination; however, according to Academic Analytics data, its department seems to have only 7 faculty and has an SRI percentile of 38.2.

UNL Statistics ranks 9 of 16 Big Ten university statistics departments, or in the 50.00th percentile.
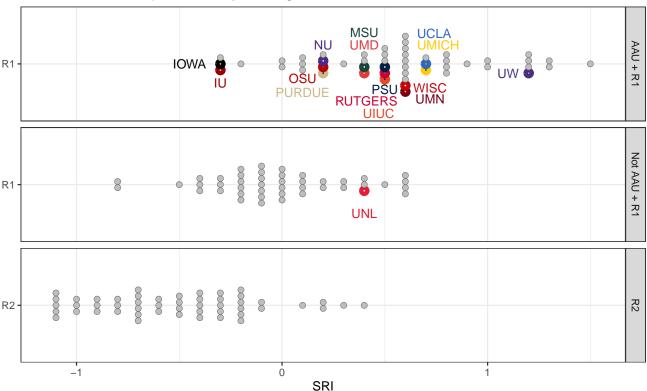
Figure 5.1: Comparison of UNL to other Big Ten statistics departments. UNL's SRI is just slightly below the median of all Big Ten statistics unit SRIs. USC and Oregon are not shown because Academic Analytics does not have statistics research ratings for those universities.

5.4 AAU Universities

If instead we compare to the 69 AAU universities, all 69 have a stand-alone statistics, biostatistics, or data science department and only 3 do not have a statistics or data science department[3].

Faculty outside the department of Statistics recognize the essential function we serve and the threat to the University's standing among its peers if the Statistics department is eliminated:

> Every AAU member university and every Big Ten university maintains a Department of Statistics (or an equivalent stand-alone unit) as a core component of their research infrastructure.

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[3]AAU universities without a statistics or data science department: Brown University, Tulane University of Louisiana, University of Miami

> Eliminating ours would immediately place UNL at a disadvantage relative to our peers and signal a retreat from the standards of excellence required for AAU membership.
> – David Hyten, Letter to APC

And this assessment is shared by the chairs of other Big Ten statistics departments:

> Moreover, dissolving the Statistics Department will make it difficult, if not impossible, for UNL to achieve its goal of rejoining the Association of American Universities (AAU). – Big Ten Statistics Department Chairs

UNL Statistics ranks 33 of 50 AAU statistics departments, or in the 36.00th percentile.

5.4.1 Public AAU Universities

The administration has defined the 40 public AAU universities to be their preferred comparison group. All 40 have a stand-alone statistics or data science department (excluding biostatistics), and 30 also have a biostatistics department. Thus, even if UNL and UNMC merge at some point in the future, we will be in good company among other public AAU institutions in having both a Statistics and Biostatistics department, as these serve different functions. UNL Statistics ranks 22 of 33 public university statistics departments in the AAU, or in the 36.36 percentile.

5.5 Conclusion

While it is often desirable to be unique in a field, eliminating the statistics department would be more akin to notoriety. Statistics expertise is **essential** to the function of a modern R1 land-grant institution, particularly in a state where there is not another competing R1 institution which might serve researchers at both schools. We fear that if the Statistics department is cut, UNL will soon lose not only any hope of rejoining the AAU, but may also find its R1 status threatened. The proposed elimination of the department has threatened UNL's international reputation, but going through with that elimination would have dire consequences for the institution's standing among its peers.

> Statistics is the backbone of modern research across all fields, from agriculture and medicine to engineering and social sciences. The expertise provided by statisticians is essential for designing experiments, analyzing data, and interpreting results. Without a dedicated Statistics Department, UNL will lose its competitive edge in research and innovation, and a fall in research quality and rankings is inevitable. – Rob Hyndman, Monash University, Australia.

The Statistics department has assembled letters from a truly international array of scientists and statisticians, each expressing opposition and confusion as to the elimination of the Statistics department. Hungarian statisticians, Pakistani historians and statisticians, Australian professors, and a wide swath of very

well known statisticians from AAU and R1 schools across the country have written letters on our behalf. They cite many obvious arguments: the increased demand for statistics degrees and a workforce with data manipulation skills, the importance of statistics to a research university, and the important of statistical education across many undergraduate and graduate degree programs. Ultimately, the totality of these letters suggest that UNL will lose standing on the international stage, among its peers at land-grant universities, among Big Ten universities, and among the AAU member universities.

> You might be surprised to learn that while I'm a historian from Islamabad, Pakistan, the news of the proposed closure of the statistics department at the University of Nebraska (Lincoln) has also been making waves on my university's faculty groups and forums. I suspect that this proposal has created a global moment for the University of Nebraska (Lincoln), albeit one in which its decision-making does not seem consistent with the pursuit of learning for which the institution is otherwise known for.
>
> ...
>
> As strange as it sounds for a traditionally descriptive discipline like history, but the study of statistics is one of the vital elements in our understanding of how human societies have evolved. You might be familiar with Paul Kennedy's now classic study The Rise and Fall of the Great Powers or Peter Turchin's Ages of Discord (a structural and demographic analysis of US history), or any number of other works that deal with economic history (like Piketty's Capital in the 21st Century). These historical or philosophical studies draw upon statistical information and concepts to explain our past, our present, and our future.
>
> My own mathematics skills are rudimentary but thanks to countless statisticians, many of them based at universities and public sector organizations, and many more who produce vital work in the public domain, I can draw upon a range of insights that strengthen my discipline in numerous ways. I sincerely hope that your university will reconsider the proposed departmental closure and keep the statistics program going. – Dr. Ilhan Naiz, Professor of History, Quaid-i-Azam University, Islamabad, Pakistan

Statistics departments provide many services which are essential to modern research universities. At UNL, the statistics department also provides unique, valuable, and essential programs within the educational ecosystem of Nebraska. In addition, the department provides essential support for many other programs across the university. These contributions are discussed in Chapter 6.

6 Program Analysis

UNL has the vision to invest in statistics for decades, having started with its roots in Biometry and mathematics, and creating a Department of Statistics. The department is an invisible backbone on your campus with an impeccable impact. It not only does its own fundamental research in statistics and data science, but also has a significant impact on the research and discoveries across the campus and across Nebraska. It is the only department in all of Nebraska that offers doctoral degrees in Statistics (UNMC offers a PhD in Biostatistics). My sincere concern is the irreversible damage a decision to abolish your statistics department will have not only on your campus, but also in the state of Nebraska. I just wonder as a Dean (not just as a statistician) whether the university is, unfortunately, killing the goose that lays a golden egg. – Sastry Pantula, Dean, College of Natural Sciences, California State University

6.1 APC Criteria

The APC procedures specify criteria for the reduction or elimination of academic programs. We will address each set of criteria separately to both show that the criteria in support of reduction or elimination are not met and to show that the criteria indicating that elimination is inadvisable are satisfied. These are taken from APC Criteria for program evaluation.

6.1.1 Addressing the Criteria in Support of Reduction

1. The program's present and probable future demand is insufficient to justify its maintenance at existing levels of support. Insufficient demand may be indicated by significant decline in one or more of these areas over a protracted period:

2. the number of completed applications for admission to the program;

3. the student credit hours generated in lower division, upper division, professional, and/or graduate level courses in the program;

4. the number of students who complete majors or degrees in the program;

5. in the case of instructional programs designed to prepare graduates for specific employment, the market demand for graduates of the program;

6. in the case of service programs, the level of demand for the service provided;

7. in the case of research programs, the quality and quantity of research being conducted;

8. in the case of research programs, the level of external funding, given the relative availability of funds.

Of the fastest growing occupations identified by the Bureau of Labor Statistics, Data Scienctists, Actuaries, and Operations research analysts are 4th, 8th, and 9th, respectively. All involve statistical training, and many data science jobs would have been advertised as requiring a statistics degree even 5 years ago. However, even if we confine ourself to Statisticians, the BLS expects 9% growth in statistics positions over the next decade, which is considerably faster growth than most other professions. Thus, we can see that the market demand for graduates of our programs at all levels is there. In addition, while statistics does not pull in grants which are comparable in size to those in lab-based sciences that require laboratory equipment, AI is one of the stated research priorities of the current administration. Most deep learning and large language models are built on a fundamental foundation of statistics.

> The number of U.S. undergraduates earning degrees in statistics has increased more than six-fold since 2010, with over 5,500 bachelors degrees awarded in 2023, with the number of institutions offering such programs nearly doubling over the same period (from 95 to 184). At the Master's level, statistics degrees have increased 150% since 2010 to 5,150 in 2023, while data science and analytics-related degrees increased an astonishing 15-fold to more than 12,000 in that period. The number of universities granting statistics and data-intensive degrees also grew from 70 to 300. These trends reflect the central role of statistics and data science in today's workforce; the financial benefit to UNL, Nebraska, and the overall U.S. economy cannot be overstated. – Brad Carlin, UNL Math & Statistics alumni, former faculty at CMU and University of Minnesota Statistics, President of Biostatistical Consulting

While we are early in our undergraduate program, and have not yet existed long enough to graduate our first class, we expect that the increased demand for data scientists and statisticians should result in increased enrollment in the program over the near term, so long as we have sufficient support from the university for advertising and recruiting. Of course, it is easier to recruit students when it is possible to make statements about graduates having found jobs, or continued on to graduate school. For instance, we can advertise our Ph.D. program by saying that all graduates have found employment in their field, whether in academia, government, or industry. It is somewhat harder to recruit new students before the program has graduated its first class. This is one reason why the NE Coordinating Commission for Postsecondary Education rules require a five-year period to evaluate program enrollment and graduation rates.

Given the demand for statistics and data science education, Criteria 1.1.1.1-7 cannot be used to support elimination of the department[1].

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[1] It will take some work to undo the damage from the public proposal to eliminate the program, but we believe the economic conditions are sufficient to make this a worthwhile investment for UNL. Chapter 9 discusses several options for the future of the program which could mitigate this obstacle and could significantly improve enrollment in the program.

2. The program would normally be expected to be accredited but is not; or it is exposed to a substantial risk of loss of accreditation. If the program is not appropriate for accreditation, the program has been deemed to be of a quality or size that raises questions concerning its viability or continuation.

The graduate statistics program at UNL has been increasing in ranking over the past 5-10 years. It is seen as a small-but-quality program within our discipline, and our graduates all get jobs working within their field of study, whether in industry, government, or academia.

Our undergraduate statistics program is known for having a high proportion of statistics coursework, which is why many of our current students selected this program over Data Science and over programs at other institutions. While our undergraduate curriculum is still young, it was favorably evaluated at our last APR, which occurred before the first cohort started.

> "The undergraduate program plan is an outstanding one – we are impressed by the vision and effort that has gone into this already. We think this is very important for UNL and the State of Nebraska, given the enormous demand for people who are highly trained in statistics. Based on what has been observed nationwide, we expect this program to grow very quickly – potentially to hundreds of majors in the near future. Hence, developing and teaching thee courses, as well as addressing student advising needs will require considerable resources in terms of faculty and staff. It is important to be cognizant of the amount of time and effort to build this program. We note that three members of the external review team are in large statistics departments that have many more tenure-track faculty and teaching faculty than Statistics at Nebraska. Even with our resources, we have found it to be a challenging undertaking to find the people hours necessary to build new majors." - 2021 APR Report

Thus, we do not believe criteria 1.1.2 applies to the statistics department; it should not be used to support our elimination.

3. The program's productivity relative to the university's investment in faculty, staff, and equipment, facilities, or other resources has declined significantly.

   1. In the case of instructional programs, a significant decline in productivity might be indicated by a decrease in the generation of student credit hours of all courses per full-time equivalent (FTE) faculty over the past five years relative to UNL enrollment trends and by a low level of student credit hours per full-time equivalent (FTE) faculty in comparison to that of UNL's peer institutions and/or similar programs at UNL.
   2. In the case of non-instructional programs, productivity shall, where possible, be measured in terms of units of output appropriate to the program's mission.

Figure Figure 6.1 shows that the instructional productivity of the statistics department has not effectively changed (panel 2) over the 2020-2024 period. We suspect that this quantity is likely to actually increase if numbers from 2024-25 and 2025-26 were included, as our programs are maturing and we have taken steps
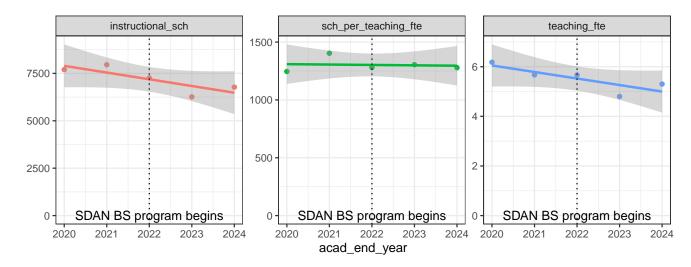
Figure 6.1: The department's instructional SCH generated between 2020 and 2024 has not significantly decreased (a horizontal line can easily be drawn across the standard error band, indicating that the slope of the line is not significantly different from zero). The SCH per teaching FTE has stayed almost constant over the 5-year period evaluated in the budget process. Meanwhile, teaching FTE has declined, but the decline is also not statistically significant. What seems clear is that any decrease in instructional SCH generated directly correlates to the decrease in teaching FTE. Thus, the department's instructional productivity has remained consistent despite introducing the Statistics and Data Analytics BS program in 2022 and the Data Science BS program(s) across colleges in 2023.

to increase class size and instructional efficiency since our new chair was hired in Summer 2024. None of these changes are reflected in the assembled metrics.

However, we are not just an instructional program - we also have research, extension, and collaboration/service missions. Our productivity in these areas has also not decreased relative to the number of people in the department and their time in rank – it is normal for younger faculty to have fewer collaborative relationships, as these develop over the course of a career and can require a significant years-long investment before meaningful products such as co-authored papers are produced.

On any of these criteria, however, the department's productivity has remained high relative to the standards of our field. Thus, we do not believe criteria 1.1.3 apply to our department.

4. The instructional productivity of a program is substantially less than the average for UNL as a whole. The level of instruction and the mode of instruction appropriate to the program shall be considered, including particularly the average number of contact hours carried by the faculty.

The instructional productivity of the department has increased significantly in the past year as the department increased section sizes for Stat 218, reducing the number of Statistics students funded through teaching. However, these changes are not included in the instructional metrics, because that data is more than a year old. In addition, there are expected inefficiencies that occur at the beginning of a new program - initial classes are small and are expected to grow (if the program is given adequate support). Our instructional efficiency is comparable to other departments with similar profiles, such as Mathematics: we have graduate students who assist with teaching general education courses, but major courses are primarily taught by faculty.

5. The program's reduction or elimination will not substantially impair the viability or quality of other UNL programs.

The elimination of the statistics department **will damage** the viability of programs in Actuarial Science, Data Science, Agronomy, Agricultural Economics, and others, as shown in Table 6.2.

In addition, specific graduate statistics courses other than Stat 801/802/870 are often required by committees in Agronomy, Engineering, and other disciplines.

> My background is in quantitative genetics and plant improvement—I owned my own company for 30 years, worked for a multi-national corporation, and spent nearly 7 years as a faculty member in the Department of Agronomy and Horticulture… The proposal to eliminate the Department of Statistics at UN-L will deliver a severe blow to all the biological sciences at UN-L, but especially the Plant and Animal Sciences graduate programs (who already collaborate extensively to offer many courses together in these statistically related disciplines). It will effectively eliminate our ability to offer most graduate degrees in these disciplines, or relegate our graduate programs to the "minor leagues." – Thomas C. Hoegemeyer, Ph.D.
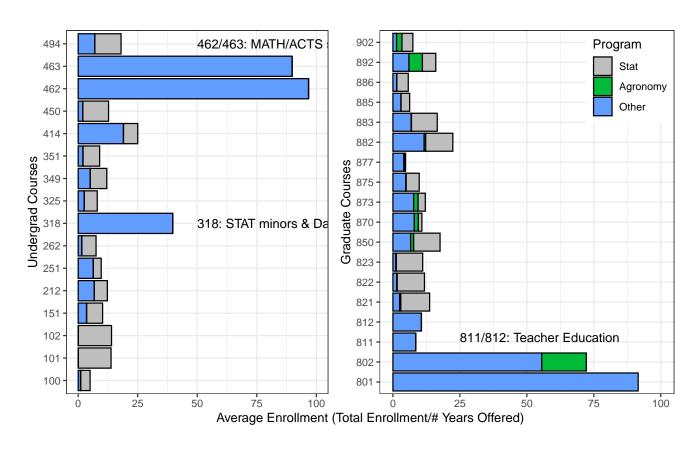
Figure 6.2: Statistics course average enrollment by major/nonmajor. Agronomy students . Stat 218 and 380 have been omitted to make comparisons easier. Many statistics courses serve students across a variety of outside programs.

It is clear that the current proposal to eliminate all statistics courses on campus other than 218, 380, 801, 802, and 870 will dramatically hurt programs across campus. Thus, under criteria 1.1.5, the program elimination cannot be justified.

6. The program's contribution to the UNL missions of instruction, research, and service is sufficiently marginal not to justify maintenance of its present size.

The Statistics department at UNL has around 13 FTE, and yet manages to offer a BS, MS, and Ph.D. program, undergraduate and graduate minors, and a large number of courses which are required or necessary for other degree programs. This contribution to the teaching mission of the university is significant.

However, the contributions of the statistics department extend to the research mission as well, though in statistics these contributions are considered service rather than research. While we train graduate students from other disciplines, we also have collaborations across campus, assisting other faculty and graduate students with their research. Many of these collaborations are not documented in coauthored papers or grants, because statisticians view collaboration and consulting as part of the job, and as long as it isn't a commitment involving large amounts of time (say, more than 1 day/week), we do not usually require compensation and simply hope that the collaboration will eventually lead to coauthored papers.

Up until this budget reduction proposal, this "unseen" component of faculty labor seemed to be well understood in IANR, and was also reflected in P&T evaluations of statistics faculty. Faculty in Statistics have helped to design extension web applications to share research findings from Biosystems Engineering with farmers, assisted with the visualization of observational data in Animal Science, discussed visualization methods with qualitative researchers in CEHS, and more.

In addition to those contributions to other disciplines research, research in statistics has the potential to impact both our field and other fields in interesting ways. Statistics faculty regularly publish software packages to make our methodological research available to others. Some of the packages available on CRAN (a software repository for R statistical software) authored or coauthored by UNL faculty include: `GGally` (103,575), `bulletr` (294), `cmcR` (483), `cmpsR` (317), `ggmosaic` (16,697), `ggparallel` (1,245), `ggpcp` (6,376), `lvplot` (3,511), `nullabor` (8,086), `productplots` (16,266), `qqplotr` (24,677), `rotations` (748), `toolmaRk` (213), `x3ptools` (1,379), `ggenealogy` (332), `highlightr` (176), `dmtl` (271), `tidychangepoint` (231). Numbers shown in parentheses are the 30-day download counts as of October 4, 2025 from CRAN repositories (additional downloads may have occurred via GitHub).

Section Section 4.1 details our research ranking compared to other statistics departments among AAU universities. It is clear that our department is punching well above our weight per FTE across many different dimensions of the teaching, research, service, and extension missions at UNL. We have been, for several years, the "little department that could". As a result, we do not believe criteria 1.1.6 applies to our department either.

6.1.2 Addressing the Criteria Indicating that Elimination is Inadvisable

1. The program has achieved a national or international reputation for quality as indicated by objective evaluations.

The UNL statistics department is recognized by many leading statisticians as a small, but powerful program:

- "The department is highly visible, and internationally recognized for its contributions to education and both collaborative and methodological research. At a time when the amount of data is exploding and misinformation is spreading across the internet (and increasingly, even being promoted by some of our own elected leaders), the need for UNL to be a leader in the promotion of statistical literacy is more acute than ever." – Brad Carlin, UNL Math & Statistics alumni, former faculty at CMU and University of Minnesota Statistics, President of Biostatistical Consulting

- "The University of Nebraska has a distinguished record, which I believe must not have been adequately captured in whatever statistics you may have been given; and their work has been valuable to me personally. In fact, during the pandemic, I spent a great deal of time studying publications from the University of Nebraska's Statistics Department. I later invited faculty members from University of Nebraska to speak at the Stanford statistics seminar and also arranged meetings with people in the health sciences industry who were interested in using group testing ideas from which the Statistics Department of the University of Nebraska is a pioneer to solve an urgent problem — scaling Covid tests to larger user populations when few PCR machines are available. This type of work will be essential the next time we have new public health emergencies." – David Donoho, Professor of Statistics, Stanford University

- "This is a small but globally impactful unit that significantly enhances the university's reputation." – Dianne Cook, Professor of Statistics, Monash Business School. ASA Fellow, R Foundation Board Member, International Statistical Institute Member

- "UNL Statistics has made significant contributions to the field, and includes several highly-influential researchers whose work has had a profound impact. I have personally worked with two of your faculty — Professor Heike Hofmann and Professor Susan VanderPlas — of whom I have the highest respect. Professor Hofmann is a leading figure in data visualization, whose work has shaped how data is presented and understood globally. Professor VanderPlas is a rising star in statistical computing and statistical graphics, who recently won a prestigious NSF career award." – Rob Hyndman, Professor of Statistics and former Chair, Department of Econometrics & Business Statistics, Monash University

- "I visited UNL this summer as Program Chair of the IISA 2025 conference, a major international meeting that brought leading statisticians and probabilists to campus. I was struck by how lovely and modern the IISA 2025 venue was—the infrastructure was first-rate; I genuinely found myself wishing we had something like that at Columbia. Sourav Chatterjee (Stanford)— arguably the most influential probabilist/statistician of his generation—delivered a keynote, underscoring the scholarly

profile UNL can attract. I met many members of your department; they were collegial, ambitious, and committed to elevating UNL's stature. In particular, Prof. Bertrand Clarke is a distinguished scholar whom I hold in the highest regard—an asset to UNL. The department is trying to grow; in a moment when Statistics, Data Science, and AI are central to society and the economy, abolishing a statistics department makes no sense." – Bodhi Sen, Professor and Chair, Department of Statistics, Columbia University

- "Statistics is a small department with outsized impact on IANR – it is remarkable how much the department is accomplishing with the relatively small number of faculty." – 2021 APR Team Report

- "The undergraduate program plan is an outstanding one – we are impressed by the vision and effort that has gone into this already. We think this is very important for UNL and the State of Nebraska, given the enormous demand for people who are highly trained in statistics." – 2021 APR Team Report

While the APR reports are the closest we can come to objective evaluations, the time period over which evaluations can be obtained is limited, given that we have not had an undergraduate program for very long. The department's rating in US News and World Report is #66. While USNWR uses methodology that has frequently been criticized, we provide information here because it demonstrates both the growth of the field and the increased perception of the statistics department. In 2010, when rankings began for statistics programs, UNL was not listed (only 22 Statistics departments and 8 Biostat departments were included)[2]. In 2014, UNL was listed as RNP (essentially, unranked). In 2018, UNL was not listed at all but the number of universities in the list had increased to 98 ranked statistics and/or biostatistics departments. In 2022, UNL was ranked 66th among 101 universities, indicating a steep increase in the perception of the department.

The rankings are updated every 4 years. If UNL closes the statistics department, will it discover in May 2026 that we should have been a point of pride for the university? We strongly believe that under criteria 1.2.1, the department's reputation is sufficiently good to recommend against its elimination.

2. The program supplies significant instruction, research, or service that UNL is better equipped to supply than other colleges or universities.

The UNL statistics program supplies instruction, research, and service to UNL which cannot be easily supplied by other universities. As the next point demonstrates, we are alone within the state of Nebraska in providing both graduate and undergraduate degrees in Statistics. That is, the only other collection of a significant number of statisticians in the state is UNMC Biostatistics, but they fill a very different niche in the research ecosystem of the state and are ill-equipped to serve both the medical school and UNL researchers.

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[2]USNWR does not archive past rankings, so this information was obtained from a contemporaneous graduate cafe forum post, which is suboptimal but necessary for obtaining historical information.

Table 6.2 provides a list of degree programs which require statistics courses which will not be taught under the current budget plan. Figure 6.2 shows the proportion of majors and nonmajors in statistics courses: the proportion of nonmajors is sufficiently high to demonstrate that we provide critical instruction for programs across UNL.

> [T]he decision to close the statistics department does not reflect that philosophy ["vertical cuts"], as the work of Statistics supports that of every other unit within IANR, and many across the university. The training and teaching provided by Statistics faculty is critical to the training of the vast majority of graduate students throughout IANR who work on projects relevant to agronomy, plant breeding, animal science, and value-added agriculture. – Professor James Schnable, Nebraska Corn Checkoff Presidential Chair, Department of Agronomy & Horticulture

> The Statistics Department is irreplaceable. Its contributions span education, research, and economic development, touching every student, every faculty member, and every industry in Nebraska. Eliminating this department would harm education, cripple interdisciplinary research, weaken the state's workforce, and undermine Nebraska's ability to compete in the AI- and IT-driven economy of the future. – Zhenghong Tang, Professor & Associate Dean for Research & Innovation, College of Architecture

We feel that both objective quantitative and subjective qualitative evidence supports the fact that the statistics department and its programs are essential to the university and the state of Nebraska. Thus, under criteria 1.2.2, the APC should recommend the department and its programs be retained.

3. The program is the only one of its kind within the State of Nebraska.

The colleges and universities in the state of Nebraska:

Table 6.1: Colleges and Universities offering undergraduate and graduate degrees in Nebraska. While some institutions offer programs in Data Science, UNL is the only university offering a BS, MS, or Ph.D. in Statistics. Institutions only offering theological degrees, medical degrees, or associates degrees have been excluded from this table to save space.

School	Undergraduate	Graduate	Notes
Chadron State	Minor		
Peru State			
UNK	Minor		
UNL	BS, BS Data Science	MS, Ph.D. Statistics	
UNO	Stat Conc, in Math degree	MS Data Science	only 6 hours of STAT req'd for either program
UNMC		MS, Ph.D. in Biostatistics	
Wayne State			

School	Undergraduate	Graduate	Notes
Creighton	BS Data Science		
Doane	BS Math and Data Analytics		
Hastings College	BS Actuarial Science		
Nebraska Weslyan	BS Data Analytics		In-major courses offered fully remote through other institutions.
Bellevue University	BS Data Science	MS Data Science	Fully online, 36 hrs in-major
College of Saint Mary			Only Math BS
Concordia University			Only Math BA/BS
Midland University			Only Math BS
Nebraska Methodist College			
Union Adventist University			Only Applied Math BS
York University			Only Math BA

Table 6.1 demonstrates that UNL's statistics programs are unique within the state. Other universities may offer programs in Data Science or Analytics, but these typically involve much less coursework in Statistics and will equip students for different jobs which focus on visualization or management of data rather than the analysis of data to produce useful insights. Section 6.4 includes a discussion of how these undergraduate Data Science and Data Analytics programs actually drive demand for UNL's MS program, rather than competing with UNL's BS in Statistics and Data Analytics degree. Clearly, under criteria 1.2.3, elimination of our department and its programs is inadvisable.

    4. The program is an essential program for every university.

Statistics programs and coursework are essential for every university with programs in science, technology, mathematics, and engineering; statistics coursework is also essential for developing quantitative reasoning skills in all undergraduate and graduate students.

    5. The program's elimination would have a substantially negative impact on education and societal concerns in Nebraska.

In an era of misinformation and "alternative facts", the quantitative reasoning skills students gain from statistics courses are of primary importance, helping students evaluate claims and evidence using the scientific method. In addition, however, Nebraska's economy is at least significantly based on agriculture. The digital agriculture revolution has begun, and requires many more individuals to have some familiarity with

data analysis and statistical computing skills. The digital agriculture minor at UNL requires three Statistics courses, two of which are primarily statistical computing. If the statistics program were eliminated, the minor's curriculum would have to change, and would likely require at least 6 hours of coursework in computer science or the development of corresponding courses within CASNR, but without the expertise of the statistics faculty (several of us specialize in various aspects of statistical computing).

> Although I have no discipline expertise in those other departments, I do know that Statistics has an advantage that none of the others possess. Because I wrote in support of the Department's planned undergraduate program in February, 2021, I know that the first cohort of students is not expected to graduate until later this year or next. Evidence from our experience here at NC State University as well as from other math/stat/cs/quantitative departments across the United States, suggests very strongly that the nascent undergraduate program will grow by leaps and bounds. Simply stated, Statistics education and training is a growth industry and will be for some time (at least until AI replaces all of us). It strikes me as shortsighted to pull the rug out from under a program that in a few years time has very strong potential to be a dean's and provost's bragging point. In the four years since the decision was made to start the new undergraduate program, the reasons for doing so, the wisdom of doing so, and the ROI of doing so, have all strengthened considerably. – Leonard A. Stefanski, Alumni Distinguished Professor, Statistics, NCSU

"Data Science" has likewise been a buzzword over the past decade, and the data science BS programs take approximately 1/3 of their coursework from Statistics. Data science without statistics has no Science – statistics is the glue that holds the discipline together. The loss of the statistics department at UNL would seriously damage both the reputation of the program and the course offerings in Data Science, leading to difficulties across the College of Arts and Sciences and the School of Computing. These programs are essential for Nebraska students to be able to obtain training in a growing field that is only more in demand as "AI" becomes the new buzzword. Thus, under criteria 1.2.5, it is unwise to eliminate the statistics department.

> 6. The program's elimination would result in substantial loss of revenue currently derived from grants, contracts, endowments or gifts.

The letters received during the APC feedback process make this argument better than we could:

> Disbanding the department incurs immediate costs such as teach-outs, redistribution of general education and graduate methods courses, and the loss of central consulting capacity. It also leads to longer-term reductions in tuition revenue and partnerships. Equally important, grant competitiveness impressively declines: NIH, NSF, and other agencies increasingly require statisticians as co-investigators and insist on prespecified analyses, rigorous design, and reproducible workflows. Proposals lacking these elements tend to perform worse, resulting in fewer awards and a smaller overhead base for the university in the future. In my experience, the lack of a statistician among the core investigators on a research grant has almost always been a notable

weakness in every panel I have been involved with, even with the new grant format. – Michele Guindani, Professor, UCLA Biostatistics, ASA Fellow, ISI elected member, ISBA Fellow, past Editor in Chief of Bayesian Analysis, Statistics Membership Engagement Chair, AAAS

In addition, the Department of Statistics, both via teaching and consulting has been and continues to be an integral part of the research performed by IANR and the Beadle Center. These groups continue to garner a large share of the total research grants awarded to the University. Statistics faculty are consistently integral to the design, analysis, and interpretation of nationally important studies. If we are serious about remaining an "R1" university, much less regaining AAU status, we absolutely need these people, the courses they teach, and the help they provide. In my professional judgment this is best done by retaining a stand-alone Department of Statistics. The alternative is to hire MOST of these professors as faculty in other departments—they are integral to our success.

My wife and I have donated nearly a million dollars to UN-L, and have helped raise millions more through the University of Nebraska Foundation—you are welcome to check with them. I see no reason to continue if UN-L can no longer have strong programs in these fields. – Thomas C. Hoegemeyer, Ph.D.

It is clear that the reputation damage to UNL from eliminating the department will increase the scrutiny of grants written by UNL PIs at NSF, NIH, and other federal agencies. In addition, UNL alumni recognize that eliminating statistics has a profound effect on the competitiveness of UNL programs, and this will have an effect on donations through the NU foundation as well as direct donations to the university. As such, criteria 1.2.6 supports APC recommending that UNL keep the Statistics department and programs intact.

7. The program represents a substantial capital investment in specialized physical plant or equipment that could not be effectively redirected to alternative uses.

The Statistics program has invested significant sweat equity in developing our SDAN major, but we expect that this is not what the criteria refers to. In reality, Statistics is relatively inexpensive for the value it provides to the university - we require only chalkboards, paper, computers, and coffee to function (and the university isn't expected to provide the coffee).

8. The program is central to maintaining the university's affirmative action goals.

Statistics is an incredibly diverse field - unlike Mathematics and most other STEM fields, Statistics has an approximately even distribution of men and women. We also have considerable racial diversity in the field, which helps us to recruit graduate students who self-pay from other countries.

9. The program gives the University of Nebraska-Lincoln its distinctive character.

UNL is well known for agronomy, engineering, and business programs, including prestigious programs such as the Raikes school. All of these fields heavily depend on statistics, and require coursework in statistics as well as input from statisticians to successfully compete for research grants. While the department may not give UNL its distinctive character, it functions as very necessary but often invisible structural support for a number of UNL's most distinctive programs. As a result, under criteria 1.2.9, the department should not be eliminated.

6.1.3 Addressing Criteria Indicating that Reduction is Inadvisable

1. The program's nature is such that reduction would impair the critical mass necessary to have adequate quality.

The statistics department is operating on the minimum FTE which could reasonably offer programs at the undergraduate, MS, and Ph.D. levels. Any reduction in headcount would force the department to choose between the undergraduate programs that are predicted to increase the profitability of the department in the future, and the graduate programs that facilitate the consulting, service, and research missions of the department.

2. The program cannot be reduced without a substantial risk to accreditation.

Statistics programs are not externally accredited, but criteria 1.3.1 addresses the risks of reduction to our programs.

3. Current projections indicate that demand for the program or its graduates will increase substantially within the next five years.

Every external opinion suggests that BS programs in Statistics and Data science are experiencing increasing enrollment and that economic demand for graduates of these programs is also increasing. We strongly believe that enrollment in the statistics and data science programs will increase once we begin graduating students and can advertise based on their job or graduate school placement. However, we will acknowledge that there is some friction in offering our undergraduate program within the College of Ag Science and Natural Resources. Current students suggest that CASNR prerequisites and general education requirements are unappealing relative to the freedom of CAS and COE requirements, which may account for the low enrollment in CASNR's data science program.

> Indeed, workforce realities cut the same way. Student demand for statistics and data science is sustained and high, and employers across tech, biotech, finance, climate, and government hire at every degree level. Closing a department in the face of that demand misaligns the university with student interest and employers' need, ceding enrollments, tuition, and partnerships to peer institutions that are expanding, often by re-forming as "Statistics & Data Science" and integrating computation with inference. – Michele Guindani, Professor, UCLA Biostatistics

We think it likely that enrollment would be higher if our undergraduate program were located within the School of Computing (thinking back to the 1968 plan to create a School of Computing with Statistics and Computer Science departments) or within the College of Arts and Sciences[3]. Regardless, every expectation is that enrollment in our undergraduate programs will continue to increase for some time. Our graduate programs may increase in demand, but capacity will continue to be primarily determined by the number of faculty, as graduate students require a substantial investment of faculty time. Thus, under criteria 1.3.3, reduction in the size of the department is inadvisable.

4. Scholarly research or creative activity of the faculty within this program, as shown by publications, creative productions, honors and awards, external funding, or other objective measure, is higher than others in the same or related peer disciplines.

Figure 4.2 shows that UNL's statistics department has a scholarly research index (as computed by Academic Analytics) comparable to AAU universities and at the top of non-AAU R1 institutions. This suggests that reduction is inadvisable under criteria 1.3.4.

6.2 Effects of Proposed Cuts on Outside Programs

Statistics departments have been flourishing across the country. They are vital in terms of being at the foundation of Data Science. They bring in more external funding per capita than almost every department on a Liberal Arts campus. They provide support and an invaluable resource for research investigation across the entire institution. should be viewed as one of the most valued groups on the campus. I can assure you, speaking as a former Department chair and long time faculty member, that this is certainly the perspective of Duke University. …
This elimination decision, if enacted, would dismantle a vibrant department that has long served as a cornerstone of fundamental research in Statistics, interdisciplinary research, graduate education, and statistical consulting across the university and beyond. I strongly urge you to reconsider this drastic action. – Alan E. Gelfand, James B. Duke Professor of Statistical Science and Professor of Environmental Science and Policy, Duke University.

6.2.1 Mathematics

This section was contributed by Alex Zupan, Undergraduate Chair, Mathematics, and Doug Pellatz, Senior Academic Advisor, College of Arts and Sciences

Cutting the Department of Statistics will have significant and lasting effects on the undergraduate program in the Department of Mathematics. Elimination of courses will be most deeply felt by students majoring

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[3]An informal survey of current students suggests the CASNR general education requirements are perceived as less useful or relevant than similar requirements in CAS and COE.

in CAS Data Science and by students pursuing the Statistics and Data Science Option and Mathematical Finance Option within the Mathematics major. We were relieved to see IANR's plan to continue to offer STAT 218, 318, 380, 462, and 463, which means there would be sufficient Statistics courses offered to complete the Data Science major and the Math major on the Mathematical Finance and the Statistics and Data Science options[4]. However, the Statistical Modeling focus area of the Data Science major would likely need to be eliminated or greatly revised considering the proposed cuts. There would also be far fewer Statistics course options available with the Statistics and Data Science option of the Math major.

As of the beginning of the fall 2025 semester, a total of 26 students had declared a Math major within the Statistics and Data Science option, and 21 students had declared within the Mathematical Finance option. The number of students graduating in the former option has been continuously increasing since the introduction of this option in 2020. The CAS Data Science major has seen even more dramatic increases, with 17 declared majors in the fall of 2023, 59 declared majors in the fall of 2024, and 83 declared majors in the fall of 2025. The curriculum for these majors is well-balanced between Math, Computer Science, and Statistics courses, with input and shared leadership among all three departments, and we view this major as one of the most interdisciplinary majors in the university. Losing the statistics department would be a significant blow to this valued interdisciplinarity.

One motivating factor for the steep growth curve of the Data Science program is a strong positive jobs outlook. This field is highly regarded across disciplines. In a 2023 conversation with Stephen Cooper, the former Director of the Raikes program, he declared that within five years, he expected most Raikes students would have Data Science as one of their majors. Cutting one of the three pillars of the Data Science major would almost certainly hamper this growth. Students graduating within the Statistics and Data Science option of the Math major have thus far had excellent internship and career prospects. When they graduate, we ask students to fill out a voluntary exit survey, and in 2024 and 2025, students in this option have reported completing internships at companies such as Kiewit, 84.51°, the Federal Reserve Bank of Kansas City, and they report having jobs as data scientists, software engineers, and a number of other positions.
This field and its employment prospects are enjoying a wave of growth and popularity, and we can choose to grow with it, or we can hamstring our efforts with cuts that may ultimately prove to be shortsighted.

Finally, we understand that statistics courses will continue to be taught at UNL, but we have grave concerns about the long-term ability of the university to attract high-achieving statistics faculty with modern knowledge about a quickly evolving field, the type of faculty members who can provide high-quality instruction to our majors and who have the expertise to lead undergraduate research projects in data science.
The department has been in conversations about our curriculum with Bill Anderson, a retired data science expert who held leadership positions at Microsoft, United Healthcare, and Ford, and who has consulted for senior design groups within the Raikes School. In a recent meeting, Bill reported that the use of statistics

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[4]The public plan released by IANR does not include 318, 462, and 463, which have been identified as essential by CAS. As a result, there would not be sufficient Statistics courses to complete the Data Science major, or the Mathematics degree with Finance or the Statistics and Data Science options.

in the real world is dramatically changing.

The meteoric rise of AI tools has enabled data scientists to implement new solutions with unprecedented speed, but according to Bill, these solutions require statistics for measurement – to determine to what extent new techniques are working and whether they are reliable, ethical, and fair – and the industry has not yet fully realized this need. Our Data Science majors, with their unique synthesis of mathematical, computing, and statistical knowledge are well-positioned to be leaders in their fields upon graduating from UNL, and without a thriving Department of Statistics, we may not be able to continue making this assertion with confidence.

6.2.2 University-Wide Impact

The statistics department teaches courses which are required for degree programs across the university.

> The plan proposes to strategically deploy a portion of state-appropriated funds to continue to offer:
>
> - Critical student competencies. Undergraduate and graduate students would continue to gain essential skills in statistics and data analytics for their future careers. We anticipate course offerings would include STAT 218, STAT 380, STAT 801, STAT 802, STAT 870, complemented by additional coursework in R programming, bioinformatics, computational biology, quantitative genetics/genomics, and data analysis interpretation and visualization offered through other units.

Unfortunately, the budget proposal has massively under-estimated the importance of statistics in curricula across campus, as shown in Table 6.2.

Table 6.2: Statistics courses required by other programs across campus. The budget proposal calls for maintaining some statistics courses; programs which require courses that will not be offered are highlighted.

Program	Level	College	Classes
Fisheries and Wildlife	UG	CASNR	STAT 218 or STAT 380
Forensic Science	UG	CASNR	STAT 218
Environmental Science	UG	CASNR	STAT 218
Animal Science	UG	CASNR	STAT 218
Regional and Community Forestry	UG	CASNR	STAT 218 or STAT 380

Agricultural Leadership, Education and Communication, Agricultural and Environmental Sciences Communication Option	UG	CASNR	STAT 218
Grassland Systems	UG	CASNR	STAT 218
Plant Biology	UG	CASNR	STAT 218
Insect Science	UG	CASNR	STAT 218
Agricultural Economics, Quantitative Analysis Option	UG	CASNR	STAT 380
Agricultural Systems Technology	UG	CASNR	STAT 218
Biochemistry (CASNR), Computational and Systems Biochemistry Option	UG	CASNR	STAT 380
Digital Agriculture Minor	UG	CASNR	STAT 151, 251, 218
Actuarial Science (CAS)	UG	CAS	STAT 462, 463
Biochemistry (CAS), Computational Biochemistry Option	UG	CAS	STAT 218
Meterology-Climatology	UG	CAS	STAT 380
Actuarial Science (Business)	UG	Business	STAT 462, 463
Secondary Education: Mathematics	UG	CEHS	STAT 380
Software Engineering	UG	Engineering	STAT 380
Computer Science	UG	Engineering	STAT 380
Mathematics, Education Option	UG	CAS	STAT 380
Mathematics, Mathematical Biology Option	UG	CAS	STAT 380
Mathematics, Mathematical Finance Option	UG	CAS	STAT 380
Mathematics, Statistics and Data Science Option	UG	CAS	STAT 380, 2 additional 300/400 level STAT courses
Data Science, CAS	UG	CAS	STAT 218 or 380 + STAT 318 -or- STAT 101 + STAT 102; Included in focus areas: STAT 251, 351, 212, 301, 302, 325, 412, 414, 432, 443, 450, 462, 463, 464, 474, 475, 478, 468

Data Science, Engineering	UG	Engineering	STAT 218 or 380 + STAT 318 -or- STAT 101 + STAT 102; Included in focus areas: STAT 251, 351, 212, 301, 302, 325, 412, 414, 432, 443, 450, 462, 463, 464, 474, 475, 478, 468
Agricultural Economics, PhD	G	CASNR	STAT 882
Complex Biosystems, PhD	G		STAT 801
Biomedical Engineering, PhD	G	Engineering	3 credits of graduate level statistics
Biological Engineering, PhD	G	Engineering	3 credits of graduate level statistics
Civil Engineering, PhD; specialization in Transportation	G	Engineering	STAT 801
Finance, PhD	G	Business	9 credits in graduate level statistics

In addition to the listed courses, many graduate statistics courses are taken as electives (or graduate committee-level requirements) to ensure that students have appropriate quantitative training for their research topics and fields. Courses like Stat 850 – Computing Tools for Statistics – teach R and python "data wrangling" skills, data visualization, reproducible research, and statistical simulation. The undergraduate computing sequence, Stat 151, 251, and 351, are similarly useful across multiple disciplines, though these courses were developed for the statistics undergraduate program. Relatively quickly after the courses were created, the Digital Agriculture minor was created with the requirement that students take Stat 151 and 251. Similarly, we believe that Stat 349, Technical Skills for Statisticians, might be useful to students in Computer Science who need a technical writing course, though this potential was only identified recently, and we would need to get ACE 2 certification for the course.

Statistics is one of three departments participating in the cross-college Data Science majors program; even though CASNR has indicated a desire to eliminate their Data Science option, there are still students in two other colleges who are required to take multiple statisics undergraduate courses for the major. Many focus areas require statistics courses, and the Statistical Modeling option would be impossible to complete without our courses. The credibility of a Data Science degree without the participation of statisticians is questionable - statistics is the foundation of data science, and many variations of "data science is a sexy word for statistician[5]" have been uttered at different points as the phrase "data science" caught on.

The proposed budget reduction plan does not account for the costs of teaching Stat 218, 380, 801, 802, and 870. Currently, some of these courses are taught by graduate TAs, who will no longer exist if the graduate program is closed. The remainder of the courses are taught by Statistics faculty, who are slated to be

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[5]Nate Silver, Joint Statistical Meetings, 2013.

eliminated as well. The one remaining head of consulting cannot physically teach all of the sections of Stat 218 which are currently taught, let alone teaching 380, 801, 802, and 870 on top of the Stat 218 courses. Stat 218 is taken by approximately 20% of undergraduates at UNL and is an extremely important course for building quantitative literacy among undergraduate students. Without a plan to ensure that Stat 218 is taught by people who understand statistical pedagogy, this proposal will majorly weaken quantitative education at UNL and diminish the value of a UNL degree.

6.3 Undergraduate Program

At the request of the CASNR Dean, our department has implemented an undergraduate program in Statistics and Data Analytics (approved 2021, first cohort 2022) and is an important component of the undergraduate Data Science programs in CASNR, School of Computing, and the College of Arts and Science (approved 2022). The undergraduate program requires 51 hours of statistics coursework, making it unique within the ecosystem of undergraduate statistics programs; this was a deciding factor for several of our current students who chose UNL over other universities offering statistics degrees.

The department has developed the new courses for this program[6], and has implemented this program without any additional TT faculty or professors of practice positions intended to assist with the additional course load. These additional courses may be reflected in the metrics in some ways – it is possible that research output might have decreased slightly given the large increase in teaching and course design load, as was predicted by the review team in the 2021 APR if we did not continue to increase the department size to manage the increased course load.

> The main resources needed to implement the undergraduate Statistics and Data Analytics major and the forthcoming Statistical Data Science major are people and energy. The major requires the development of a considerable number of new courses. To develop these courses with only the existing faculty would require major sacrificees to faculty research programs and to their ability to collaborate with IANR and other faculty at UNL. New faculty will need to be hired to develop coursework for the majors. - 2021 APR Report

However, we do not think that this is the case: research output in the department has been relatively steady over the last 5 years, and some of the faculty most burdened by course development have also had record numbers of publications accepted.

What is clear is that the additional resources promised by IANR to allow the department to successfully develop, deliver, and grow the undergraduate SDAN and Data Science programs never arrived. Faculty have been so busy developing the courses to ensure that students can graduate on time that we have

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[6]Course development has occurred without course releases, representing a significant increase in effective teaching workload and requiring unpaid work during the summer and winter breaks to prepare 1-2 new preps every academic year for some of the faculty in the department.

not had additional time or energy to devote to recruitment and outreach across campus. The proposed elimination of our department sends signals across campus that:

- new program development will put your department at risk during the inevitable next round of budget cuts, as the metrics won't account for the development of the program, and
- extending the department beyond current FTE on the promise of future resources is not a risk worth taking.

New program development is an **investment** in the future of the university and an investment in the people of this state, which should pay dividends to the people of the state through increased economic activity, better educational opportunities, and increased quality of life. Eliminating the statistics department before we can graduate our first cohorts of Statistics undergraduates is like buying a new stock offering high and selling during a dip, losing money and also the opportunity to capitalize on the gains as the stock matures.

> The development of new undergraduate majors is very important not only to UNL but more broadly to the state of Nebraska given the urgent need for highly trained statisticians and data scientists. Furthermore, this program will generate substantial resources for IANR; the department needs resources to develop, deliver, and grow these programs. - 2021 APR Report

CCPE guidelines require that programs have been operating for at least 5 years (and more practically, 9 years) before evaluation, because 5-year graduation rates and cohort sizes are part of the evaluation criteria. The Statistics BS program has only been operating for 3 years, making an evaluation of the program based on cohort sizes very premature.

> As you will be aware, the department has recently established an innovative undergraduate programme designed to train the computationally skilled applied statisticians and data scientists that the private and public sectors everywhere (in my experience) are trying to find. The first cohort will graduate soon. The department has significant expertise in this area, and your institution is about to see the benefits. – Thomas Lumley, Chair of Biostatistics, Professor of Statistics, University of Auckland

Many of the internal and external letters urged the university to reinvest in the statistics department.

> This is not the moment to dismantle capacity—it is the moment to strengthen it. UNL should not only preserve but actively invest in the Statistics Department, building on its proven strengths in data science, analytics, and applied research. Doing so will ensure that UNL fulfills its mission as a land- grant institution, supports Nebraska's industries, and positions the university for long-term success in an increasingly data-driven world. – Zhenghong Tang, Professor and Associate Dean for Research and Innovation, College of Architecture

6.4 Graduate Programs

UNL's MS program serves as an integral part of the ecosystem of statistics and data science in Nebraska.

> Doane has maintained a productive relationship with UNL's Statistics graduate programs. We utilize Dr. Chris Bilder's excellent textbook in our MTH316 Categorical Analysis course, and several of our alumni have successfully matriculated to your program. Two of our alumni will complete their master's degrees this spring, fortunately before any potential program closure. Three of our current seniors are planning to apply this spring, assuming the program remains available. Our successful alumni who completed UNL's Statistics program include these leaders, who have risen to the top of their organizations:
>
> 1. Billy Garver, UNL Statistics M.S., 2013, Chief Compliance Officer & Co-owner, Leibman Financial Services, Louisville, NE *Donated over $100,000 to Doane last year*
> 2. Julie Couton, UNL Statistics Ph.D., 2017, Senior Data Scientist, Incredible Health
> 3. Katie Kallenbach, UNL Statistics M.S., 2012, Statistician, USDA
> 4. Zack Gabelhouse, UNL Statistics M.S., 2005, Director of Client Strategy, Deluxe Corporation
>
> – Peggy Hart, Ph.D. Statistics, UNL. Associate Professor of Mathematics & Data Analytics, Doane University

UNL tried to establish a Ph.D. program for at least 50 years before it was actually established in 2003 with the formation of the Department of Statistics. It is worth examining the motivating factors behind the creation of the Ph.D. program before examining the program itself.

In the 1993 Biometry APR Self-Study, the following reasons were provided; they have been summarized here for brevity, but can be found on pages 28-30 of the self-study report

- Graduate student recruiting: good students will want a program that offers a Ph.D. in addition to a M.S.
- Research efficiency: accumulated consulting-inspired research problems can be addressed by graduate students.
- Consulting efficiency: consulting-inspired research and methodology development fuels Ph.D. dissertations. In addition, graduate students can do statistical consulting, providing additional capacity.
- Teaching efficiency: Labs for graduate courses cannot be easily taught by MS students until they have taken the course.
- Faculty professional development: time constraints limit faculty ability to develop new areas of expertise.
- Enhanced value of Biometry to IANR, UNL, and Nebraska. Statistical quality control improves economic efficiency. A Ph.D. program could make meaningful contributions to the state economy.

The graduate programs at UNL were motivated primarily by the consulting and service missions of the Biometry department. Corresponding programs in Mathematics & Statistics on City campus provided the ability to get Math degrees with concentrations, focus areas, or minors in Statistics, and seem to have developed from demand rather than necessity.

If the department of Statistics is eliminated along with its programs, leaving only 1 FTE to do statistical consulting, that one person will very quickly find themselves inundated with more work than one person could do in a decade. The consulting desk currently requires the support of 5 graduate statistics students who work at least 100 hours a week on consulting problems (the true total is likely higher).

In addition, development of new methodology in statistics and in applied domains including agronomy and animal science, the natural product of statistical consulting, will effectively cease. The current proposal indicates that Stat 801 and 802 will continue to be offered; these are the graduate courses which required graduate TA support in 1993 and still require that support today[7].

Our graduate students are extremely in-demand: to our knowledge, every MS and Ph.D. graduate in statistics has found work in their field, whether in industry, government, or academia. Many of these students mentions feeling uniquely empowered to work in *many* fields using their Statistics degree. This sentiment goes back to John W. Tukey: "The best thing about being a statistician," he once told a colleague, "is that you get to play in everyone's backyard.".

We feel that it is more effective to allow our graduate students and graduates to speak about the UNL Statistics program - it is well designed, though like any other program could use some updates, but it is far more important to show how effective it is at equipping students for careers in Statistics.

> When I graduated, I felt like a kid in a candy shop – I could take my newly acquired skills into literally any industry. I eventually landed in retail marketing. In my first job, even though my co-workers were all data analysts and modelers, none of them had a background in Statistics, so it was rewarding to help improve our processes with more statistically sound methods, improving turnaround timing, accuracy, and insights. – Dana Cracker, MS Statistics (2008) from UNL

While the department has produced excellent researchers who are very well known in the field, these same graduates remember the department not only as laying the foundation for their academic and economic success, but for its supportive environment and mentoring. While this quote is long, it is still only a fraction of the original letter, and the story is important for motivating the importance of statistics to this state as well as highlighting unique characteristics of this department's programs.

> I would like to explain how the Department of Statistics transformed me—a first-generation college graduate and son of a living Nebraska veteran who has spent 49 years paralyzed—from a mediocre high school graduate to a full professor at an R1 university by age 38.
> ...

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[7]Under the current program, however, graduate statistics students no longer take Stat 801 and 802.

As a Lincoln native, I was a first-generation college applicant with close to the bare minimum requirements to be admitted as an undergraduate student at UNL. I was fortunate to have Chapter 35 GI Bill benefits and a tuition waiver from the Nebraska Department of Veterans Affairs. This enabled me to fully dedicate myself to the fisheries and wildlife program within the School of Natural Resources. Very early in my undergraduate career, I realized two things. First, while I found the fisheries and wildlife undergraduate program fun, engaging, and beneficial, a career directly in that field was better suited for students with tremendous family support, both financially and in caregiving. Second, I could still do what I love —working on important environmental problems —and get paid well as a statistician. And so, I forged a path forward and created a program that should have but didn't exist at UNL. I took about a dozen statistics and related classes. I engaged with several current faculty members in the Department of Statistics, who were instrumental in ensuring I succeeded in upper-level and even graduate-level statistics classes during my undergraduate studies and helped with my UCARE project. I graduated in 2010 with Highest Distinction and 169 credit hours (enough for a triple major at most universities). But it was 2010, there was a financial crisis, no jobs and all I had was a nearly worthless degree in fisheries and wildlife. With little or no job prospects, I remember thinking that it sure would have been nice to have an undergraduate degree in statistics at UNL—something most other R1 universities have. Sure, I had an undergraduate experience that resulted in four published scientific papers, but having that statistics degree would have made me employable. I would also like to add that I did all this while being the sole caretaker for my father, the Nebraskan veteran who has spent 49 years paralyzed and still lives in Lincoln.
…
In what I can only describe as pure luck, UNL landed an NSF IGERT award in 2009, and I was fortunate to be selected to be part of that program. This was by far the best-paying "job" I could find at the time. This enabled me to obtain a graduate fellowship and pursue the first joint PhD in Statistics and Natural Resources Sciences, which I finished in three years and nine months. And again, I did all of this as the sole caretaker for my father, which included a gruesome injury that resulted in a leg amputation during my first year as a PhD student. I am truly grateful for the faculty of the Department of Statistics at UNL, who created an environment where I could thrive despite what was going on in my personal life.
…
The rest of the story is short and academic. I would write my first 500+ page graduate-level textbook on Bayesian statistics by age 32, tenured at age 34, co-director of an institute at age 36, and full professor with 80+ published papers by age 38. While all of these personal boasts are research-heavy, I am most proud of my teaching evaluations and students. Statistics, unlike many of the undergraduate degrees offered at UNL, enables students from lower-and middle-class Nebraska families a path to an engaging, fun and well-paying career. – Trevor Hefley, Ph.D. Statistics, UNL. Professor & Co-director, Institute for Digital Agriculture and Advanced Analytics, Kansas State University

More recent graduates also highlight the local, national, and international demand for Statistics degrees

and the economic success that comes along with a graduate degree from our department.

> I am a 2023 PhD graduate from the Department of Statistics at UNL. I earned my BS in Statistics in 2011, my MS in 2018, and finally my PhD in 2023. My connection to statistics goes back even further since my father worked as a Statistician for the Government of India for more than 35 years. This field has been an inseparable part of my life, and I owe much of my career success to the excellent training and mentorship I received at UNL. I currently work in the technology industry as an Artificial Intelligence engineer, building large-scale solutions that are used globally.
> ... Graduates of the department have consistently shown their value in the job market. Many of my peers went on to work for the US government, leading universities, major insurance companies, and global technology firms. Personally, I was able to intern at LinkedIn and IBM and later received offers from Meta, Adobe, Travelers Insurance, Liberty Mutual, Mutual of Omaha, and Hudl. These opportunities would not have been possible without the rigorous training I received at UNL. The department's track record in placing graduates in top positions is also a powerful tool for recruiting future students. – Ved Piyush, Ph.D. Statistics (2023), UNL

Our students are equipped to work as consultants, professors, and researchers across university systems.

> The Statistics Department played a defining role in my academic and professional journey. Through my time as a graduate student, I gained extensive teaching experience in undergraduate statistics courses, worked on consulting projects as part of my coursework, and received continuous support and mentorship from faculty. These experiences equipped me with the skills and confidence I now rely on in my career as an Assistant Professor of Statistics. Without the training and guidance of this department, I would not be where I am today. – Aleena Chanda, Ph.D. Statistics (2025), Assistant Professor, Juniata College.

Our graduate students sometimes fall in love with the state and don't want to leave, finding jobs that enrich Nebraska's economy. UNL's statistics programs directly counter "brain drain", providing local employers with an important source of trained professionals in in-demand fields.

> I am not from Nebraska originally and did not consider moving here prior to receiving an offer from the statistics department. However, once I got to Lincoln I not only learned a lot but fell in love with the area. I was thrilled when I got a job as a data analyst in Omaha. My employers told me that I was hired specifically because of my experience in the statistics department.
> ...
> I have never been surrounded by as many smart, caring, and hard-working people as I was in the Department of Statistics. Nearly all of these people, similar to myself, come from out of state, with many coming from out of the country. All of these people gave up their old lives to come be a part of UNL, the city of Lincoln, and the state of Nebraska. Without another program like ours in the state, they and future potential students will take their great talents

elsewhere and contribute to the "brain drain" happening in Nebraska. I previously mentioned how much I love the area, but if this decision is finalized, I am concerned about the long-term outlook of the state and my future here. – Ryan Lalicker, MS Statistics, 2025

Our department provides opportunities for students to get an education that will improve their economic prospects and the state's economy as well. Statistics Ph.D.s working in industry have a median salary of \$195,000 (ASA 2020 compensation survey, pg 13), while those with a M.S. working in industry have a median salary of \$150,000. Getting a graduate degree in statistics can meaningfully change a student's economic outlook.

Impact on graduate students
I am a Nebraska native, who was able to attend UNL thanks to a Regents Scholarship. Without the grants and graduate assistantships I received through the Department of Statistics, I would not have been able to afford graduate school, and most likely would have left Nebraska. Instead, I discovered a passion for statistics and data science education because I was encouraged to experiment and take risks as an instructor. I built a career in academia and industry as a data science educator because of the opportunities I had at the department. – Aimee Schwab-McCoy, Senior Manager for Content Authoring – Data Science, Mathematics, and Statistics, Wiley

While not all of our statistics graduates stay in Nebraska, many go on to make important contributions in a variety of fields, including pharmaceuticals and drug regulation, that are incredibly important to ensuring quality of life for Nebraskans.

As a graduate student (2005-2010), I was approached by my PhD advisor Walt Stroup, professor and Chair of the Department of Statistics at the time, with the opportunity to become a member along with him of the Product Quality Research Institute (PQRI) Stability Shelf Life Working Group (SSL WG) to expand their initial research on shelf life estimation. I accepted this opportunity and was able to work along with members of industry, academia, and FDA to assess the current methodologies for shelf life estimation of pharmaceutical products. This research led to my dissertation topic and completion of my PhD requirements.
The UNL faculty's extensive knowledge and expertise proved vital in helping me communicate statistical aspects to the SSL WG, allowing me to bridge the gap between academic/statistical theory and real world problems in ways non-statisticians could understand. The opportunity to become a member of the SSL WG provided valuable experiences in collaborative research and impact outside the UNL community. The Department of Statistics provided me the academic background and developed my consulting skills, allowing me to analyze data from clinical trials and successfully explain statistical concepts to drug developers and researchers at Novartis. My education provided invaluable influence on my professional development and involvement in bringing several new drugs to market at Novartis. – Michelle Quinlan, Ph.D. Statistics and Director of Biostatistics, Early Development Analytics, Novartis Corporation

Many students mention the consulting projects that helped them build the skills they rely on as professional statisticians, demonstrating that not only is SC3L important to the IANR research community and to many departments across UNL, but it is also an important component of our graduate training. UNL requires consulting training at both the MS and Ph.D. level, and these classes support the help desk while ensuring that every UNL graduate is prepared to collaborate and consult with non-statisticians, carefully applying statistical training to domain problems.

> During my time in the department, I benefited from exceptional faculty mentorship, rigorous training, and a vibrant intellectual community that continues to shape my work as a Biomedical Data Scientist at the University of Kentucky (UKY). My work colleagues and faculty mentor at UKY complemented my statistical consulting and collaboration skills, as well as the knowledge I learned on the statistics fundamentals. I would never have been in the place I was leaving graduate school if not for the support of the faculty in this department. Their comprehensive curriculum over the years, including experimental design, regression, multivariate, and categorical analyses, spatial and time-series modeling, and more, prepared students to enter the workforce with highly sought-after skills. In addition to my own training, I contributed to the department's growth by working alongside Dr. Kathy Hanford, Dr. Reka Howard, Dr. Walt Stroup, and Dr. Bert Clarke to strengthen the Statistical Consulting and Cross Collaboration Lab (SC3L). The SC3L has become a cornerstone of research support across the university, assisting countless students and faculty in producing higher-quality, more rigorous research. Graduate students and faculty in the department have served as collaborators or consultants on hundreds, if not thousands, of research projects, theses, dissertations, and peer-reviewed manuscripts. These contributions are foundational to maintaining UNL's status as a top-tier R1 research university. Without this support, students across the university would lose access to critical expertise in applying statistical methods to their research. At the same time, aspiring statisticians would be deprived of the hands-on experience with real- world data and collaborative projects. This type of training is essential for their development as professionals and would disappear without the Department. – Kelsey Karnik, Ph.D. and Biomedical Data Scientist, University of Kentucky

Others highlight the importance of the mentoring and relationships built at UNL; these intangibles cannot be captured by metrics but are extremely important, both in demonstrating impact within a field, and in demonstrating the culture within the department.

> During my time at UNL, two professors in particular had a lasting impact on my career. Dr. Erin Blankenship, my first instructor at UNL and later my PhD advisor, sparked in me both a love of statistics and of teaching through her contagious passion and patient mentorship. She guided me through my dissertation with just the right balance of support and independence, and she remains a trusted colleague and collaborator to this day. I also had the privilege of learning from Dr. Chris Bilder, whose clear, detailed instruction provided a model of excellence in teaching. The courses I later developed at NKU in categorical data analysis and applied multivariate analysis were directly inspired by his classes, and I continue to draw on the foundation he

built for me. Faculty like Dr. Blankenship and Dr. Bilder exemplify the kind of expertise and dedication that make UNL's statistics program so impactful, not only to students but to the broader academic community. – Jacqueline Herman, Ph.D., Professor and Statistics Program Coordinator, Northern Kentucky University

The mentoring and relationships continue to be important long after students have graduated, as they continue to talk with professors in the department about interesting problems they have encountered.

Beyond my initial education, the Statistics Department has remained an invaluable resource throughout my career. The ability to consult with my former professors when facing complex statistical challenges has been critical to my success. This ongoing support underscores the department's role not only in educating students but also in fostering a lifelong connection with alumni who contribute to society and the economy. – Qingwen Zhao, MS Biometry, 1996. President AM Solutions, LLC

Statistics maintains joint degree programs with other disciplines, which provide students with the opportunity to pursue interdisciplinary studies during their graduate training as well as in their later careers.

Statistics has been a cornerstone of my academic and professional growth. Pursuing a joint Ph.D. in Economics and Statistics gave me a deeper analytical foundation and sharper research skills than economics alone could provide. Because of this combined training, I entered the job market with a distinct advantage. Employers across sectors increasingly value candidates who can apply statistical reasoning to complex economic and policy questions, and this dual expertise opened opportunities that would not have been available otherwise. Today, I serve as an external faculty member in a statistical consulting unit, even though my primary appointment is in a different college. This role allows me to collaborate across disciplines, demonstrating how statistical skills complement and enhance work in economics, business, the social sciences, and beyond. From my experience, students who strengthen their analytical abilities through statistics are better prepared for the evolving workforce. The discipline fosters critical thinking, data literacy, and problem-solving—skills that are essential in research, industry, and government. When paired with fields like economics, these abilities create graduates who are adaptable and highly sought after. – Mariana Saenz-Ayala, Ph.D. Economics and Statistics & Associate Professor of Economics, Georgia Southern University

Our graduates often consider themselves part of the department even after they have graduated and begun professional careers, highlighting just how much of a community students have at UNL. It is hard to rebuild this type of culture, but it is critically important both for student retention and for alumni fundraising once current students have gone on to get well-paying jobs.

While I am sure that every other department on the chopping block is also defending their department relentlessly and is arguing as hard as we are, I hope you consider that the Statistics Department stands out among all the other departments on your list. The statistics department is the only department that fosters tools, research, and analysis, that will address emerging

challenges in a data-rich world. Not to mention, the ever-growing fields like AI and Machine Learning that require a fundamental knowledge of Statistics and Data Science. – Paulus Hermanto, MS Statistics, 2023

Our current students gave up careers and stable employment to come to this department because of its reputation for excellence.

I moved to the U.S. nearly two months ago to begin my Master's/Ph.D. in Statistics at UNL. Before coming here, I had a very stable life and a good job as a math teacher in Vietnam, where I had worked for 8 years. A lot of people asked me if it was worth it when I gave up a very stable job, good income, and familiarity to start over in a new country. But I persisted that my dream was to gain a deep knowledge and research skills in statistics. I believed that UNL was the right place to make that dream come true. I chose UNL over another school in Ohio that also offered me funding because I believed in UNL's reputation and commitment to excellence. – Thu Dang, current MS/Ph.D. student (Ms. Dang began classes at UNL in Fall 2025)

The community our students find in the department, and the traditions among the graduate students (such as the midwesterners taking everyone from tropical regions coat shopping in mid-October to ensure they are well equipped for winter) are very important parts of our departmental culture.

As a first year, native Nebraskan PhD student in statistics I feel inclined to share my thoughts and feelings on the proposed budget cuts. I feel the proposed budget cuts would be a grave injustice not only for the faculty and students of statistics department but for the state of Nebraska as a whole. I have lived in Nebraska for the past 22 years of my life and have seen the impact which statistics and data driven solutions can provide.

I already have a master's degree in mathematics from UNO and I received an internship at Smeal Fire Apparatus in Snyder, NE this past summer where I worked as a Supply Chain and Logistics intern. With my gained analytical experience I was able to create an automated vendor quality assessment system which in turn increased profitability for the company. This not only benefited me but because of what I did this helped us switch vendors and enable the shop to be able to meet quarterly goals which resulted in a plant wide bonuses. Not only did this leave a good impression with my superiors, but enabled two hundred fellow Nebraskans to have more money to spend in the economy of Nebraska. With a PhD in Statistics and a desire to stay in state after graduation more meaningful procedures would be created to continue to not only generate myself an income but help Nebraskan citizens. A PhD in Statistics would give me more skills to continue to do work like this for the industry throughout the state.

However, not only have I seen the impact of statistics at my place of work but in the agricultural sector. My fiancee is from a farm and getting seeds which yield the best crops is a means to an income for her family. These seeds are developed in labs and tested. These results are verified and analyzed through statistical means. Cutting the statistics department would partially eliminate the state's ability to perform important agricultural analysis which improve

the state's primary economic sector. Since UNL is the only university in the state with a PhD in statistics, eliminating people valuable to agricultural sector seems counterproductive to statewide economic hopes.

If UNL cuts their statistics program I do intend to transfer to another Big Ten university. The reason I choose Nebraska is because of my personal ties to this state, my love of the genuinely caring helpful faculty, and the familial feeling on the third floor of Hardin Hall. Our department provides services to other departments including offering necessary classes to help others gain meaningful data driven insights along with analyses for others thesis's and dissertations. We collaborate across fields to further research at the Nebraska's only R1 institution. I believe our department is a crucial part to UNL's standing as an R1 institution and plays a vital role in getting Nebraska back into the AAU. – Thomas Spoehr, MS/Ph.D. student in Statistics (Mr. Spoehr started his coursework in Fall 2025)

Ultimately, the graduate programs at UNL are increasing in visibility and in academic rankings not only because of the department's efforts to continuously improve our programs, but because of our graduates – the relationships they built and the education they received through our programs is the foundation for a promising future, if the APC and Chancellor reconsider the proposal to eliminate the department.

My experience at UNL was not only academically enriching but also personally rewarding. The friendships and professional relationships I built during my time there continue to support my career. Similarly, my fellow graduates share my view that the education we received was unparalleled, empowering us to excel as educators, researchers, and colleagues. I urge the university leadership to reconsider the elimination of the Department of Statistics. Preserving and strengthening this department is crucial for the continued success and excellence of UNL. – Marina Ptukhina, Ph.D., Associate Professor, Department of Mathematics and Statistics, Whitman College

7 Centralized vs. Distributed Statistics Model

7.1 An Historical View of the Distributed Model

> The effort now apparently underway at University of Nebraska—to disestablish the statistics department and disperse and/or scatter data analysis throughout campus—is a throwback to 100 years ago and will only land us in the same situation as we encountered then. – David Donoho, Professor of Statistics, Stanford University

The administration's proposal to move to a distributed model for statistical expertise across the university is not a new one – it has been tried before at UNL and describes the period between roughly 1900 and 2003, where statisticians within Math, Sociology, Psychology, Industrial Engineering, and Computer Science were scattered throughout City campus, and various incarnations of consulting service centers and the Biometry department served IANR's need for agricultural statistics support. This model was not successful, both because funding was outpaced by demand and because it became challenging to recruit qualified statisticians without having a Statistics department.

> Maintaining the status quo will result in a decline of the quality of Biometry services. The decline will occur because of professional stagnation and because of exhaustion. Biometry faculty can only respond to a finite number of requests for their services. They are currently at that limit. – 1993 Biometry APR Self Study, pg 35

Consider these two anecdotes from separate halves of campus detailing attempts to find a home for Statisticians across campus during the late 1960s and 1970s:

> [T]he proposal to create a separate department was broached anew in 1968 to Dean Peter McGrath of the Arts and Sciences College. He agreed that the proposal had merit and a decision was made to create a School of Computational Sciences in the College with two academic departments, namely Statistics and Computer Science. … The administration then changed its mind and decided that the best alternative would be to recognize the existence of mathematical statistics as a program by changing the name of the Department of Mathematics to the Department of Mathematics and Statistics. – Statistics History at UNL (Math Department, ~1998)

In the early 1970's, there was a discussion of an area program in statistics involving the statistical faculty from the Department of Mathematics, the Biometrics Center (now the Department of Biometry), the Department of Educational Psychology, and other departments having faculty statisticians. In 1985, a committee was formed to study the feasibility of combining the statistical faculty of the Department of Mathematics & Statistics and the Biometrics Center into a Department of Statistics. – 1993 Biometry APR Self Study, pg 31

Obviously, the creation of a centralized department of Statistics did not actually happen until 2003. The awkward split of responsibilities between Biometry and Statistics also made it difficult to form cross-campus collaborations. These disadvantages are common knowledge within Statistics departments across the country, and are well documented both in our discipline's scientific literature and within our written and oral history.

The lack of lifelong training of faculty devoted to rigorous data analysis and its methodology on campus means that it will be difficult for researchers seeking large interdisciplinary grants to find data analysis experts on campus and for graduate students, post docs etc. to find rigorous training. And that means that University of Nebraska will be at a disadvantage in competing for grants against other universities that continue to support strong, centralized statistics programs. Those programs produce an identifiable resource on campus that offers data analysis experts who can support work on campus funded by NIH, NSF and DOD. – David Donoho, Professor of Statistics, Stanford University

"Demand for statistics instruction at both the graduate and undergraduate level has grown since World War II, paralleling the growth in interest in statistics nationwide. The growth of statistics at UNL has been hampered both by its lack of visibility within a Department of Mathematics and Statistics and by the fact that the resources which support undergraduate instruction in statistics have been spread across so many departments." – Statistics History at UNL (Math Department, ~1998)

Clearly, the distributed model did not work well as it initially evolved in departments across campus at UNL. However, we can briefly consider the pros and cons of each model (distributed and centralized) to consider how it might look if implemented today.

After reviewing the provided rationale, I believe the "distributive model" being considered reflects a fundamental misunderstanding of statistics as a discipline, its potential growth and widespread relevance. While numerous disciplines certainly utilize statistical methods, these methods exist because of the dedicated work of professional statisticians. In a world where all organizations rely on analytics for decision-making, the role of statisticians in developing and validating new techniques is more crucial than ever. The statistics major recently established at UNL represents a forward-thinking investment in your university's future, since data-related careers continue to offer exceptional opportunities for graduates with four-year degrees. – Peggy

Hart, Ph.D. Statistics, UNL. Associate Professor of Mathematics & Data Analytics, Doane University

[P]lease think carefully about the fact that this model (the distributed model) has been tried before on many campuses and found wanting, in numerous ways. The current "statistics department model" has proven itself time and again on campus after campus. – David Donoho, Professor of Statistics, Stanford University

7.2 Comparing the Distributed and Centralized Models

A modest proposal
Faculty in all departments are skilled academic writers and communicators. Rather that dissolving the Department of Statistics, consider applying the "distributed" model to English and Communications. Faculty can teach writing and communication courses within their departments, resulting in much higher savings than dissolving the Department of Statistics. Ridiculous? If other departments are able to teach statistics effectively, why not writing and communication? Or perhaps, statistics instruction and research, which is vital to a vibrant research community, is best left to statisticians. – Aimee Schwab-McCoy, UNL Statistics Ph.D. and Senior Manager for Content Authoring – Data Science, Mathematics, and Statistics, Wiley

Mission	Centralized Model	Distributed Model
Faculty Recruitment	Departments can (but do not have to) hire "quant" experts, split appointments (even across colleges) are used to handle joint courses and facilitate collaboration between departments. Statisticians are willing to come to an up-and-coming statistics department that is seen as a valuable part of the university infrastructure.	Statistics experts ("quants") are embedded in domain departments to teach statistics courses. Recruiting qualified faculty is difficult.
Teaching	Service courses are taught primarily by the Statistics department with coordination from other departments to calibrate course offerings	Service courses are taught in departments across UNL: Psychology, Educational Psychology, Sociology, QQPM, Agronomy, Animal Science, SNR, Engineering, Computer Science, Mathematics

Mission	Centralized Model	Distributed Model
Advising	Statistics faculty often serve on outside committees to provide statistical advice on student projects, building collaborations across departments.	Department experts serve on all committees for graduate students within the discipline.
Consulting	SC3L provides consulting. Funding provided from any college which wants to have statistical consulting resources available to faculty.	A single consultant is available for IANR faculty. There is consistently insufficient time available to meet demand for consulting across colleges.
Service	The statistics department is a resource described in grant applications like other "common good" resources across campus, like HCC and ORI. Statistics faculty are readily located to assist with collaborative grant projects.	Statistical support for grants is provided by distributed faculty (if one with the right expertise can be located, see Figure 7.2) or by faculty at other institutions outside of Nebraska. Research quality may suffer and proposals may be seen as less competitive by funders.
Degree Programs	Statistics BS, MS, and Ph.D. programs are located within the Statistics Department.	No statistics major or advanced statistics coursework is offered to students at any level

> The few well-known statisticians in the country have positions elsewhere from which it would be impossible to dislodge them with the bait to be offered; for though the department wishes to have statistics taught as an auxiliary to the study of X, it feels that there must be no question of the tail wagging the dog, and that economy is appropriate in this connection. – Harold Hotelling, The Teaching of Statistics (1940)

A more modern expression of the same sentiment was received in one of the letters sent in support of the department:

> I think it is flawed reasoning to expect that the needs for excellence in statistics at UNL can be instead obtained through "a distributed model that leverages expertise embedded across IANR, UNL and the NU system" for the following reasons: (1) To achieve excellence in statistics, you need to be able to attract and retain the most talented statisticians – most are much less likely to be recruitable to UNL if they don't have a Department of Statistics to call their academic home; (2) Statisticians working in other Departments are often overloaded with responsibilities to their own Department – for example, statisticians in our School of Medicine or in our Cancer Center have very little time for teaching and mentoring, as their primary responsibility is grant-related and project-related research; (3) Such a model would make it much more difficult to efficiently coordinate service teaching of statistics throughout the whole university system; (4)

Figure 7.1: Connections between departments that must exist to find the right statistical expertise and to coordinate statistics courses in the centralized model.
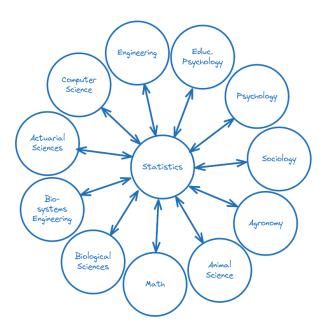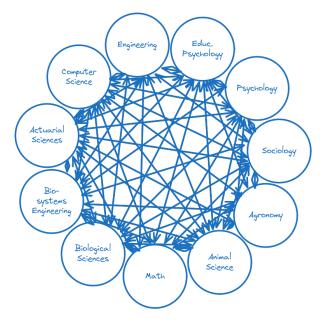

Figure 7.2: Connections between departments that must exist to find the right statistical expertise and to coordinate statistics courses in the decentralized model.

It is more efficient to offer courses in linear mixed models under a statistics prefix than to teach separate courses for Agronomy, Animal Science, Engineering, Psychology, and Sociology across five departments with five instructors. While it may be necessary to offer two courses (one which accommodates the lack of linear algebra or calculus prerequisite work), this is still a substantial savings over offering five separate courses. One failing of a distributed model where statisticians are embedded within each department is that it results in duplication of effort across departments, and if departments cannot hire someone with statistical expertise AND domain expertise, then it becomes difficult for that department to meet the needs of both students and faculty.

The psychology department has tended to keep their statistics expertise in-house even with the existence of the Statistics department. Yet, they have had some trouble finding someone to teach their courses on Multilevel modeling (or, in statistical parlance, linear mixed-effects models). This highlights one major problem with the "distributed model" – **it is hard to find domain experts who are also experts in quantitative and statistical methods, and often, these experts demand more money than statisticians who are trained to work across a variety of domains**. Even when these experts can be found, they are highly in demand and may be unwilling to move to a university that does not also have a statistics department. Thus, the distributed model is in many ways set up to fail, as it makes assumptions about the availability of statistical expertise that are at odds with the economic demand for statistical skills in industry and government. Ultimately, those who are interested in quantitative methods will often choose to get a more flexible degree in Statistics rather than a specialized degree in Quantitative Psychology, because they can "play in everyone's backyard" with the Statistics degree.

In the early 1990s, Columbia's Statistics department was very small (fewer than five faculty) and at risk of closure. Instead of eliminating it, the university supported a strategy to build—notably a world-renowned MA in Statistics program that attracted talent and generated resources for the university. Today, Columbia Statistics ranks among the top five departments nationally, with 27 ladder faculty—larger than our Mathematics department. That outcome was only possible because the institution chose to invest in a foundational discipline rather than dismantle it. – Bodhi Sen, Professor and Chair, Department of Statistics, Columbia University

In reality, UNL currently does not have a fully centralized model, and the real efficiencies that could come from a centralized model remain at least partially unrealized. Take the Computer Science and Computer Engineering department, which offers courses such as CSCE 100 (Introduction to Informatics), CSCE 155T (Computer Science I: Informatics Focus), CSCE 320 (Data Analysis), CSCE 411 (Data Modeling for Systems Development), CSCE 412 (Data Visualization), CSCE 420 (Introduction to Natural Language Processing), CSCE 474 (Introduction to Data Mining), CSCE 478 (Introduction to Machine Learning). One or two individuals who were appointed to have 49% responsibility in CSCE and 51% responsibility in STAT would be able to reduce duplication between CSCE and Statistics by working to determine which

classes could be cross-listed, which courses might exist in both departments, and which courses should remain separate because of discipline specific focuses, much as courses in CSCE and ECEN are often, but not always, cross-listed. In other departments, there are courses which could clearly be merged with statistics courses, such as ECEN 305 and MECH 321, which seems to cover similar topics to STAT 380. ECEN 305 and STAT 380 are listed as equivalent prerequisites for ECEN 453, Computational and Systems Biology, indicating that there is some awareness of this duplication in the ECEN and STAT departments. In a wider array of departments, CRIM 300, EDPS 459, ECON 215 are all equivalent to STAT 218 and acknowledged in the catalog as mutually exclusive for degree credit.

Of course, this efficiency would only be possible with cooperation, but it might be feasible to become more efficient as a university if the right SCH attribution model were used or if the STAT department was collocated within e.g. the School of Computing.

In Psychology, courses like PSYC 350 (Research Methods and Data Analysis), PSYC 450 (Advanced Research Design and Data Analysis), and PSYC 451 (Multivariate Research Design and Data Analysis) certainly involve a large proportion of statistical instruction, though they also teach topics that are not covered in statistical methods courses, like the use of APA format and how to write a literature review (PSYC 350). However, dual appointments might be useful here as well - it may be easier to recruit someone to a Statistics department with a particular focus on social science represented by a joint appointment in psychology. This may also be more palatable to the psychology department, as they place a particular emphasis on students learning methods within the context of psychological problems. Professors with dual appointments might alleviate concerns about psychology methods courses being taught by statisticians.

Political Science (POLS 287, Data Analysis in Political Science) and Sociology (SOCI 430, Advanced Social Network Analysis, SOCI 465, Survey Design and Analysis) also have courses which would be considered well within the realm of statistics. Again, we are not suggesting that these courses should be taught solely in or by the statistics department, should it continue to exist, but that we could work out some sort of cross-listing and teaching responsibility agreement so that all of our programs become more efficient and our students have access to more electives and opportunities. Ideally this would come with joint appointments to reinforce inter-department communication and build stronger ties between the Statistics department and units in CAS and COE.

The reality is that a truly centralized model is more efficient university-wide. What is more important than the organizational structure, however, is maintaining the statistics Ph.D., MS, and Statistics and Data Analytics BS programs, so that Nebraska's students continue to have these educational options and Nebraska businesses have the ability to recruit highly qualified employees from a market that increasingly demands skill in data analytics across a wide range of different positions.

8 Evaluating the Budget Proposal Realistically

8.1 Statistical Cross-disciplinary Collaboration & Consulting Lab

Let us consider the proposed scenario of retaining SC3L for providing statistical consultation to IANR faculty, staff, post-docs and students. Currently, the SC3L is headed by a director who is a tenured associate professor of Statistics with more than 9 years of experience in consulting. There are 5 Statistics graduate research assistants who directly work with the clients. These GRAs are senior Statistics PhD students who are required to take Stat 821, 822, 882, 883, 825 before they are eligible to receive the GRA; only the best students across these courses are selected to work at the SC3L. Additionally, students enrolled in Stat 825 and Stat 930 play important supporting role in resolving the research problems that are brought to the SC3L. Clearly, the SC3L is a **team effort** that requires that requires each member to have completed advanced Master or PhD level Statistics courses.

Eliminating the BS/MS/PhD programs in Statistics will also eliminate that team. So, the SC3L cannot be retained in current form under the proposed elimination.

What other forms of SC3L could be envisioned that operates with the same efficiency?

- Hiring PoPs?
  - Between 2020-2025, the SC3L has served ≈ 131 clients per year. This implies that the combined powers of a director and five graduate students can allocate about 3 days to each client. It is not feasible for a single PoP to take on the workload of the entire SC3L team. The number of meetings combined with the amount of non-meeting work (computer programming, checking models, writing reports) would make it impossible for one person to complete this work efficiently.
  - Consequences: The research conducted by IANR faculty, staff, post-docs, and students, as well as other units, will suffer. This will become an impediment to achieving the "Extraordinary Research" ideal of Odyssey to the Extraordinary.

- One PoP and a team of graduate students?
  - The current plan eliminates the statistics graduate and undergraduate degree programs along with all of their core classes. Thus, there will be no graduate students in Statistics to staff the desk, and no courses to train these students (or students from other disciplines). Without training, this version of the SC3L would be ineffective.

- Two POPs?
    - This configuration has a better chance of achieving the same efficiency as we currently have, if we can acquire them. To solve the problems handled by SC3L, we need highly skilled statisticians with enough experience in handling different types of complex data. Such experience can come either through PhD training in Statistics or an extensive stint in industry (or both). A recent Ph.D. graduate is likely to be the most cost effective option. Even in the unlikely event that such a person could be recruited, how much would they cost? The American Statistical Association periodically publishes a salary survey among statisticians. From the last round of survey (circa 2021) it appears that an entry level statistics instructor (analog of PoP) costs approximately 3/4 of the salary of an entry-level assistant professor in statistics. Hiring 2 PoPs to manage an SC3L is equivalent to 1.5 FTE. The net 12 FTE savings is not realistic.

It is more likely that the SC3L will require at least 1.5-2 FTE to maintain, even without the associated statistics department programs, leaving a cost savings of 11-11.5 FTE. It is possible that these PoPs could be moved to soft money positions, like those in Biostatistics programs. However, our department went through a grueling hiring cycle to try to locate a tenured hard-money director of the SC3L and ended up hiring internally instead because we could not attract someone qualified. Based on that experience, we can confidently predict that IANR will not find a trained Ph.D. statistician who is willing to take a soft-money PoP role at UNL.

In truth, it will likely be hard to recruit *any* statistical expertise to UNL after the publicity surrounding this budget proposal. Statistics is an incredibly in-demand field, so who would risk moving to Nebraska if the university is not committed to the role of a statistics department at a public, R1, Big Ten, land grant institution?

8.2 General Education Courses

Next, who teaches Stat 218, 380, 801, 802, and 870?

Currently, the Statistics department offers approximately 17 sections of Stat 218 (8 in fall, 7 in spring, and 2 in summer), in addition to 6 sections of Stat 380, and two sections of 801 (with 2 sections of lab each) and 802. Stat 870 is offered less frequently, so we will exclude it from this analysis. The courses identified to be kept require 25 sections across 4 preps; we estimate that this would require at least 3 professors of practice to teach (assuming a 4-4 load) which are not accounted for by the current budget reduction plan. These FTEs would need to be subtracted from the savings listed, yielding only 9 FTE savings for cutting four programs (BS in Statistics, BS in Data Science from CASNR, MS in Statistics, and Ph.D. in Statistics).

We use professors of practice for this comparison rather than adjuncts both because it seems unlikely that 25 courses could be assigned to adjuncts with statistical training, given that most people with graduate degrees in Statistics can make more freelancing as data scientists than they would be compensated for

teaching courses. Certainly, it seems likely that the FTEs which are being eliminated will not be available to teach courses at adjunct rates.

The calculations for how many PoPs would be required to teach current Statistics courses that drive revenue generation for the department does not include courses not identified by IANR, such as Stat 462 and Stat 463, which are required for the Actuarial Science degrees in Business and CAS. Two additional Stat 300/400 level courses are required beyond Stat 380 for the Mathematics, Statistics, and Data Science focus area within the Math department. The Digital Agriculture minor also requires Stat 151 and 251, computing courses developed for the Statistics undergraduate major. The Agricultural Economics Ph.D. requires Stat 882, and the Finance Ph.D. requires 9 hours of graduate Statistics coursework (it is quite possible that Stat 882 and 883 would be preferable to 801 and 802 for Finance majors). This analysis does not consider the fate of the Data Science programs in CAS and COE, which would lose between one and three courses in the data science core as well as the statistics focus area that is primarily made up of courses designed for the Statistics and Data Analytics major and the Statistics minor. In order to support these additional courses, an additional professor of practice would likely be required, reducing the FTE savings from eliminating the department to 9, or 7 if the SC3L is kept as planned.

Calculations	FTE
Current Department FTE	13
FTE required for 218, 380, 801, 802	-3
FTE required for 151, 251, 462, 463, 882	-1
FTE required for SC3L	-2
Total	7

8.3 Grant Funding Losses

Elimination of the department of Statistics will lead to the loss of already-promised federal funding from NSF and NIH, among others. In total, there is about $1M of federal grant money that Statistics faculty have as PIs, as of October 2025.
Termination will lead to permanent loss of these research restricted dollars (a vital AAU metric).

The net savings from eliminating the department – even if current tuition revenues are not included and we only count the salary expenditures – is only about $300K. This is a completely reasonable amount to generate with only the current faculty, by overhauling the structure of our MS courses, increasing the number of majors in our SDAN program through outreach efforts, and differential tuition.

9 Planning for the Future

Many of the letters written on behalf of the statistics department come from administrators around the country and have practical suggestions pertinent to the situation.

> Instead of elimination, there's a practical path that meets fiscal realities while preserving the discipline:
>
> • Hit pause. Don't abolish the department—bring faculty and campus partners to the table for a focused plan.
> • Get a quick outside read. Ask a small Big Ten peer panel to suggest fiscally responsible ways to keep Statistics intact(leaner department or a cross-college institute, but with real authority over hiring/promotion/curriculum).
> • Back UNL's mission. Invest where Nebraska is strongest—agriculture and life sciences—while maintaining the core stats training students across campus rely on.
> • Find savings without wrecking the core. Share admin services, slow hiring, tighten curricula—but don't dissolve the discipline.
>
> I urge UNL to withdraw or substantially revise the proposal and work with the Statistics faculty on a solution that meets budget realities without sacrificing a core discipline central to UNL's academic identity and Nebraska's future.
> – Bodhi Sen, Professor and Chair, Department of Statistics, Columbia University

> Statistical work will go on at UNL with or without the department, as it is a necessary component for progress in nearly every field in science, social science, and increasingly in the humanities. Students will still sign up for courses, and graduate students in many departments will flood the planned "coordinated statistical consulting". But this work will be second-rate, the teaching will be scattered, and you will not be training any students to an appropriate level of expertise in one of the highest-demand STEM fields. Curriculum development will stagger to a halt, as you will not have on-campus expertise keeping up with the latest developments. You will not have any graduate students in statistics or data science qualified to serve as TAs for undergraduate courses. You will have scientists in other fields who are expert in the statistical methods that have become routine in their discipline, and this will be adequate for a time. But soon your leading scientists will find that they do not have access to research collaborations at the level of expertise they will need and demand.
> …

President Gold's strategic plan is presumably guiding this very painful process. Statistical science touches on nearly all the pillars of this plan, including multidisciplinary learning for students, integrated cross-campus research programs, partnership in Nebraska in agriculture, health care, military and industry, and data-driven decisions for stewardship. The decisions made now will reverberate for a very long time. I urge you to reconsider the decision to shut down research and teaching in an area as central to modern learning as statistical science.
– Dr. Nancy Reid, University of Toronto

Constructive alternatives: If financial pressures require change, there are less harmful options that preserve core capacity and tenure protections while achieving budget goals, such as strategic hiring freezes, administrative consolidations that maintain Statistics' academic integrity, shared service-teaching agreements, and targeted revenue-generating master's programs.
Requested action: I respectfully ask the APC to (i) oppose the elimination of the Department of Statistics and (ii) support a collaborative process that preserves UNL's long-term academic strength, advances its land-grant mission, and upholds the university's capacity in a discipline vital to modern research and education.
– Dr. Thomas Lee, Professor of Statistics and Associate Dean for Faculty, Mathematical and Physical Sciences, University of California, Davis

9.1 Revenue Generation

9.1.1 Differential Tuition

While differential tuition cannot be used just to generate revenue, it does promise a solution to some of the constraints the department has had when implementing our undergraduate program: we need more FTE to teach all of the courses that we currently have. A possible solution to this would be to propose $50/SCH in differential tuition, which, when multiplied by our 6000 SCH, will yield $300,000 in additional revenue per year, which should be sufficient to fund two PoP positions (including benefits). These positions would free up 8 courses each semester, allowing the department enough room to develop new courses for the Data Science MS (joint with Computer Science and Math) and to develop digital badges, online training programs, and other revenue generating ventures. These PoPs may also be used to reduce the department's reliance on state-aided GTA funds.

9.1.2 Online Data Science MS

The department is also a participant in the currently-paused proposal to create a fully online MS in Data Science with the Mathematics and Computer Science departments. We estimate that our portion of the revenue from this program would be around $140,000 in 2026-7 and $290,000 in 2027-8. Our department also has a collaboration with the Vellore Institute of Technology to create a joint MS degree

program, with projected tuition revenues (self-pay international students) at \$100,000 in 2026-7. Our 2021 APR report suggested that certificates and online graduate degrees should be attempted once the undergraduate program matures, and we are prepared to start that process once we graduate our first cohort of undergraduate students in May 2026.

9.1.3 Restructuring the Statistics MS

As the MS in Data Science is established, we will work to restructure our graduate curriculum, reducing our MS in Statistics to 30 hours and laying a foundation for offering an online MS in Statistics in the future. We will explore the 400/800 crosslisting model employed by computer science and engineering as well as other departments in IANR, to determine which courses it might work for, and which courses would be better served by separate sections of graduate and undergraduate students.

While there are some statistics courses which may not be easily crosslisted (the methods core of 821,822,823 is a particular challenge), we hope that redesigning the MS will allow us to streamline our curriculum and take advantage of the innovative and statistics-intensive bachelors curriculum without overtaxing our faculty. We will also pursue offering some of our computing workshops and courses as digital badges and certificates, providing an additional revenue stream.

We firmly believe that this process will set our department up for success and profitability moving forward.

9.2 A Bold Proposal: Institutional Efficiency and Data Science

Our department was created from a union of the Biometry department on East campus and the Statistics portion of the Mathematics and Statistics department on City campus. Indeed, the first APR in the Department of Statistics identified the possibility that we would be viewed primarily as an East campus biometry program.

> The Team recommends that the department actively expand its City Campus presence. This can be accomplished in several ways. First, given the potential for DoS faculty and students to interact with researchers in the biological sciences on the City Campus, the Team suggests that the faculty consider broadening the Department's "biometry" objective to "biological statistics" or another suitable term that is inclusive of this new set of collaborators... Unless the Department continues to expand its research presence on City Campus, it may ultimately be viewed by many as primarily an East Campus biometry program. This would not only be a disservice to the broader capabilities of the Department, but limit its future growth in emerging research areas present there. – 2005 Statistics APR Report, page 10

While the name Biometry seems to have faded, there is the perception that Statistics isn't a good collaborator on City campus – though, there are signs that this is changing, and even this budget process has helped our department build stronger ties on City campus with units that are proposed for elimination as well as units that recognize the importance of our discipline. We have (also) been frustrated by the difficulties in building good collaborations across both campuses. Our hope is that the systematic rethinking of our department during the budget proposal process might afford us the opportunity to make positive change, so that we can serve all of the departments across campus.

Our ties to IANR are extremely strong, and are unlikely to be jeoparodized by a rearrangement, but there are many institutional barriers to increased institutional efficiency. Throughout this report, we have commented on the possible use of dual appointments to build bridges between statistics and other departments. This combines the strengths of the distributed model (close ties with applied domain departments) with the strengths of the centralized model (a single department responsible for teaching statistics courses across campus, and a single point of contact for assistance with statistics). Ultimately, whether we are housed within IANR, CAS, COE, or a new college dedicated to data science, we believe it would be helpful to make use of dual appointments liberally, so that there are effective ties built between departments on both City and East campus. This might be more effective than the previous attempt to have funding from two divisions (CAS and IANR).

There is enough history to suggest that the department itself being jointly in two colleges results in systematic under-funding by one or both colleges. Ultimately, we are experts in data analysis, experiment design, statistical modeling, and data visualization, not in higher educational organizational structures. However, we would like to note that we are open to alternative homes that would allow us to maintain our department and programs.

> If maintaining a stand-alone Department of Statistics is ultimately deemed unsustainable, then a strategic unit realignment must be considered rather than outright elimination. To safeguard continuity, a sufficient number of Statistics faculty must be retained, recognizing that some attrition is inevitable in any reorganization. With thoughtful restructuring, budgetary savings on the order of $1M can still be achieved without sacrificing the university's academic integrity.
> – Dr. Petronella Radu, Chair, Mathematics Department, UNL

In particular, we believe there would be some efficiencies if we were to revisit the 1968 plan to form a School of Computing to house both Statistics and Computer science (of course, since the School of Computing already exists, it might need a more modern name), with the possibility of cooperation from Math and even Business (specifically Supply Chain Managemet & Analytics, Actuarial Science, and possibly Economics). Indeed, this is the strategy suggested by one of the experts in our field:

> Student demand for statistics and data science is sustained and high, and employers across tech, biotech, finance, climate, and government hire at every degree level. Closing a department in the face of that demand misaligns the university with student interest and employers' need, ceding enrollments, tuition, and partnerships to peer institutions that are expanding, often by re-forming as "Statistics & Data Science" and integrating computation with inference. … Given

these stakes, I urge you to pause this decision. If modernization and budget reduction are the goals, the right move is the opposite of closure: align titles and curricula with "Statistics & Data Science," invest in computing and reproducible workflows, and hire widely at key interfaces: causal ML, robust model evaluation, experimental design for digital platforms, and responsible AI. This is exactly the strategy being pursued at UCLA and at other first-tier research universities, which are expanding rather than dismantling their statistics programs.

The stated goal is a budget reduction of $1.75 million. In reality, the university will lose far more in weakened grant competitiveness, diminished tuition revenue, lost partnerships, and reputational harm. This decision risks sacrificing long-term strength for a short-term appearance of savings.

AI has not made statistics obsolete; it has made statistical thinking non-negotiable.

Universities that recognize this will graduate students who can build models, stress-test them, and explain their limits to scientists, regulators, and the public. Universities that do not will graduate students who can run code but lack the necessary critical thinking and cannot tell you whether to believe the output. That is not a competitive position, for the students, the institution, or the society. – Michele Guindani, Professor, UCLA Biostatistics, ASA Fellow, ISI elected member, ISBA Fellow, past Editor in Chief of Bayesian Analysis, Statistics Membership Engagement Chair, AAAS

We also think that it may be time to consider funding the SC3L as an asset for the entire university, possibly through the Office of Research and Innovation. As Table 4.2 shows, the SC3L has worked with clients from across UNL, but also with projects out of UNMC and UNK. Our consulting and collaboration contributions to the overall university mission are well recognized by other groups on campus, including the Center for Plant Science Innovation, the Mid America Transportation Center (and associated Civil and Environmental Engineering departments), Cultivate ACCESS, the College of Architecture, and more. This plan treats the SC3L as the common good that it is - its customers are often graduate students, only some of whom have grant funding available to pay the $100/hr consulting fee required for non-IANR customers. As a result, graduate students who do not have access to funds cannot get statistical help and may publish research with flawed statistical analyses, take longer to graduate, or eventually give up – all situations that would hit UNL's AAU indicators. The SC3L is a relatively small investment, but it would pay dividends as research quality across campus improved, time to publication decreased, and the resulting higher-quality articles were cited more frequently.

If UNL truly wants to stay in the Big Ten, or get back in the AAU, investing in statistics, rather than eliminating our department and programs, is an extremely efficient way to do it. Our department powers the research engine across the university.

UNL has long enjoyed a strong reputation in statistics, and I fear this decision would jeopardize that standing for many years to come. At a time when peer institutions are strengthening their commitment to quantitative sciences, UNL's proposal runs in the opposite direction. I

respectfully urge you to reconsider. Protecting and investing in Statistics is not only in the best academic interest of UNL but also in the best financial interest of the university, its students, and its research enterprise. – Brani Vidakovic, H.O. Hartley Chair and Department Head, Department of Statistics, Texas A&M University

We urge the APC and the Senior Leadership team to consider an admittedly bold counter proposal: Create a college or school of data science that will collaborate with departments across campus on research projects and grants, provide consulting services, and prepare students for jobs in a data-centric economy.

This proposal is partially based on Dr. Gold's Odyssey to the Extraordinary objective "Partnerships & Alignment Across NU" – by housing the statistics department within a structure designed with collaboration in mind, we will be more readily able to assist with research topics across the university, filling niches that e.g. UNMC Biostatistics does not currently fill within UNMC and also assisting UNO and UNK researchers as the occasion presents itself. It also aligns nicely with "Creating Sustainable Value, Effectiveness and Efficiency", as we will be able to raise possible issues of redundant courses across departments through dual-appointed positions within those departments. As departments continue to feel the pain of efficiency and repeated cuts, both departments will benefit from shared courses that reduce the required instructional FTE and make the faculty infrastructure across the university more robust. Finally, this proposal aligns with "Data Driven Decisions and Related Communication", in that we are streamlining human resources and research and instructional needs by setting up HR structures that facilitate cross-departmental communication.

9.2.1 Odyssey to the Extraordinary

Current and future goals of the statistics department are also aligned with other Odyssey to the Extraordinary ideals, including

- Inspiring All Future Learners Our department already includes experiential learning opportunities in Stat 218, 325, 825, and 930. These opportunities help students cement statistical concepts through real-world application, develop interpersonal and "soft" skills for statistical consulting, and serve the community through service learning projects. The department will continue to seek out partnerships with local organizations to involve students in in-house data consulting projects, offering "micro internships" and data fellowships where students work with external partners on applied problems.

- Supporting Faculty Success As a department, we will encourage new faculty to make use of UNL scholarly teaching programs, evaluating our undergraduate and graduate program revisions to ensure that teaching innovations lead to scholarly research and publications in the statistical education field.

- Curriculum Innovation and Alignment We will encourage our faculty to develop statistics OERs that are published both online and through traditional academic publishers. This will facilitate online coursework and "flipped classroom" modalities, improve our department's Academic Analytics ranking, and save our students money simultaneously.

- Transforming the Learning Environment Leveraging technologies for interactive drills in both python and R, we will develop online tutorials that support student learning and success, helping students to overcome common challenges and misunderstandings in general education statistics courses and statistical computing courses.

- Building a Common NU Research Identity
  A data science interdisciplinary unit would be invaluable in supporting many of the programs which are current federal funding priorities, including artificial intelligence and digital agriculture. Building a unit which has these interdisciplinary connections will facilitate flexible collaborations that can be adapted to new funding priorities as administrations change.

- Internal Programmatic Growth and Alignment
  As has been discussed throughout this report, statistics departments were formed in part because it was difficult to gain sufficient visibility when we were housed in agronomy or mathematics. Locating the SC3L in ORI to provide a common good service across the UN system will allow for better measurement of SC3L collaborations and will facilitate building better collaborations across campuses.

- Partnerships Across Nebraska
  Our department has been actively working to collaborate with P-12 institutions to provide service learning projects for Stat 325 (Zoo school data analysis) and to provide modules about statistical analysis for those competing in the science fair.

Ultimately, the suggestion

9.3 Out-of-the-Box Suggestions

Note that these suggestions are provided primarily for the APC's amusement, after having waded through this report. While both seem like reasonable suggestions that would potentially resolve the budget crisis, we suspect that both are politically not viable, but this does not make them less entertaining.

> This mention of athletics, though, does perhaps offer a way forward out of the current budget crisis. Since Nebraskans and our state elected officials (Governor, Board of Regents members and State Senators) seem as enthusiastic as ever about supporting UNL Athletics, maybe it's high time the academic arm of UNL demand that the Athletics program begin paying an annual 'user fee' for the privilege of wearing the University of Nebraska brand. While academics are being mauled yet again, the cash reserves for football, basketball and volleyball seem bottomless. A 'surcharge' on the athletic programs sponging off our state's Land Grant University and premier institution of Higher Education could well help close that $27.5 million shortfall that set this most recent bloodbath in motion. The football program, as you might recall, bought out Scott Frost's contract for $15 million dollars without blinking an eye. – Tim Rinne, Class of '79

As a matter of fairness, if you decide to cut any of your departments (not just statistics), you should cap every administrator's salary at your university at $100,000. – David Banks, Duke University Statistics Department, ASA Fellow, IMS Fellow, AAAS Fellow

A Statistics Faculty in the UN System

Table A.1: Tenured and tenure-track faculty in the Biostatistics Department at UNMC

Name	Rank	Degree	Institution
Jane Meza	Professor	Ph.D., Statistics	UNL
Kendra Schmid	Professor	Ph.D., Statistics	UNL
Lynette Smith	Associate Professor	Ph.D., Statistics	UNL
Megan Tesar	Assistant Professor	Ph.D., Statistics	UNL
Christopher S. Wichman	Associate Professor	Ph.D., Statistics	UNL
Jerrod Anzalone	Assistant Professor	Ph.D., Biomedical Informatics	UNMC
Harlan R Sayles	Assistant Professor	Ph.D., Biostatistics	UNMC
Su Chen	Associate Professor	Ph.D., Statistics	Oklahoma State University
Hongying (Daisy) Dai	Professor & Associate Dean of Research	Ph.D., Statistics	University of Kentucky
Ran Dai	Assistant Professor	Ph.D., Statistics	Univ. of Chicago
Jianghu (James) Dong	Assistant Professor	Ph.D., Statistics	Simon Fraser University
Yeongjin Gwon	Associate Professor	Ph.D., Statistics	Univ. of Connecticut
Fang Yu	Professor	Ph.D., Statistics	Univ. of Connecticut
Gleb Haynatzki	Professor	Ph.D., Statistics and Applied Probability	Univ. of California
Yunju Im	Assistant Professor	Ph.D., Statistics	Univ. of Iowa
Yin Zhang	Professor	Ph.D., Statistics	Univ. of Washington

Table A.2: Tenured and Tenure-track faculty in the Mathematics Department at University of Nebraska – Omaha

Name	Rank	Degree
Xiaoyue Cheng	Associate Professor	Ph.D., Statistics
Mahbubul Majumder	Associate Professor	Ph.D., Statistics
Lochana Palayangoda	Assistant Professor	Ph.D., Statistical Science
Andrew W. Swift	Associate Professor	D.Sc., Operations Research
Michael Matthews	Professor	Ph.D., Mathematics Education
Elizabeth Wrightsman	Assistant Professor	Ph.D., Mathematics Education
Mahboub Baccouch	Professor	Ph.D., Mathematics
Ying Hu	Associate Professor	Ph.D., Mathematics
Nicole Infante	Professor	Ph.D., Mathematics
Betty N. Love	Professor	Ph.D., Mathematics
Valentin Matache	Professor	Ph.D., Mathematics
Janice Rech	Associate Professor	Ph.D., Mathematics
Andrzej Roslanowski	Professor	Ph.D., Mathematics
Vyacheslav Rykov	Professor	Ph.D., Mathematics
Karina Uhing	Assistant Professor	Ph.D., Mathematics
Cong Wang	Assistant Professor	Ph.D., Mathematics
Fabio Torres Vitor	Associate Professor	Ph.D., Industrial Engineering
Dora Velcsov	Professor	Ph.D., Applied Mathematics

B Problems with the Analysis of Research and Teaching Data

B.1 Provision of Data and Interactive Consultation Process

APC Procedures Section 2.2:

> Information used in the reallocation and reduction process must be made available to the budget planning participants and affected programs in a timely manner so that corrections and explanations can be made before it is released to the public.

APC Procedures Section 2.3:

> The process shall ensure that administrators, faculty, students, and staff are consulted. A shared definition of the word "consultation" is essential to ensure there is ample opportunity for advice prior to recommendations being developed. Consultation is **more than just giving and receiving information**; it allows all parties the opportunity and the time necessary to **explore and offer alternatives before administrative decisions are made**. Deans, directors, chairs and heads shall follow procedures as stipulated in their college and unit bylaws and allow advice, input, and discussion by faculty, staff, and, to the extent appropriate, students prior to proposals being submitted by unit administrators. Such consultation is intended to give administrators, students, staff, and faculty an opportunity for substantive interactions that go beyond simply sharing information. One of the keys to the success of this process will be the manner with which the information considered at various stages is handled. In the early stages, it will be critical that those individuals responsible for developing budget reduction/reallocation proposals have an opportunity for candid discussions regarding the wide range of options open to them. Such candor is likely to occur only if participants are assured that the discussions will remain confidential. As the process moves forward and proposals are developed, it is essential that the scope of these working discussions expand to include units potentially affected by the proposals prior to public release.

Throughout this process, units have been unable to access the data used to compute the metrics. Some of the identified issues:

- Some of the grant numbers used for Statistics seem to be incorrect (e.g. one faculty member brought in more than the total for the department over the period listed), but we have not been able to get the source numbers or computations from ORI.

- The numbers for SCH seem to be off by a factor of 10 in 2020 relative to what they should be, across all departments.

- The number of people in the department and apportionments listed do not match the ORI calculations for %FTE in e.g. research.

The department has made enquiries about these issues, but has not made any progress in making corrections to the metrics used.

The statistics department received their own metrics in June, but, without any contextual information, it is hard to interpret the values (even with the codebook). As any statistician knows, a single data point (particularly in a multi-dimensional domain) is useless; data gains power only through comparison to relevant reference distributions. The inability to consult with upper administration and to correct data and processes which are not reliable is *critical* to a fair budget process. The statistics department has been denied this chance.

In addition, it appears that the registrar and the graduate college have been instructed not to provide departments with any data related to the budget process. This creates an us-vs-them environment where departments proposed for elimination are frozen out of the university and not allowed to share in governance processes or counter the facts presented within the proposal. This is not how the APC process should unfold.

B.2 Data Quality

There are many data quality problems which were discovered after the Chancellor's proposal but which have not been corrected. The poor data quality and documentation of the data used to assemble the quantitative metrics, and the reliance on this data in the face of identified data quality issues and systematic biases clearly indicates that the administration's committment to metric-driven improvement is at best limited to metrics that can be easily pulled from databases with minimal quality control. However, it is difficult to verify or correct data quality issues without access to the full data, which has not been provided, as detailed in Section B.1.

A few documented issues with the data are worth a mention:

- In Academic Analytics, 12 out of 1275 faculty at UNL have a degree year of 1900. Spot-checks of two of these faculty suggest that someone enterd the degree year as 19 when it should have been 2019. However, if there are any faculty at UNL who received their degrees in 1900, they would be particularly strong candidates for VSIP.

- One faculty member in the statistics department was excluded from the analysis because their apportionment was incorrectly recorded by HR. This affects department productivity metrics as well as headcount calculations, but it also revealed differences between the budgeted salary information posted online in spreadsheet form, the information available in the PDF Personnel Rosters, and the information compiled by ORI. If departments cannot even determine how headcount was calculated, how are they supposed to correct errors in the calculations?

- In Academic Analytics, TMFD's comparison group was listed as "Consumer and Human Sciences, various". Academic Analytics relies on the organization to submit the correct CIP code for the department, suggesting that someone at UNL entered the wrong CIP code. That this was not caught by ORI or another office involved in assembling the relevant data raises questions about the data validation process – or whether any data validation was performed at all.

- We could not validate the grant numbers for our department, and confirmed with ORI that we did not have access to the necessary binary variable to replicate the ORI analysis – and ORI would not release the individual data that would allow us to validate the calculations as described. Attempts to replicate `total_sponsored_awards_inc_nuf_rsch_pub_serv_teach_avg_awards_budget` suggest that there is either a problem with the data or the description of how the data was calculated:

  - If we multiply the 0.362 value for statistics (before it is converted to a z-score) by the state permanent budget from 2025-26 (just a rough estimate), we get \$481185.24.
  - A single PI in the department brought in 1.2 million dollars in grant money during the 2020-2024 period, but this variable does not appear to have been normalized by the number of FTE in the department (which is itself a potential explanation for the department size correlation).
  - The total amount of grant money brought in over the 5 year period within the department suggests that the number was not normalized by the number of years either.

B.3 Analysis Method

This section has been written with an audience of non-quantitative individuals in mind. Those with mathematical or statistical training can find a more detailed explanation in Appendix C.

Moreover, it is clear that whoever designed the data reduction method used in this analysis had internalized the idea of variable standardization but was unfamiliar with the central goal of statistics: interpreting and understanding data within its real-world context. No amount of numerical sophistication will fix an underlying mismatch between the data which is available and the data needed to answer the question of interest. The questions of interest to UNL should be:

- "which departments perform well or poorly relative to their peers?" followed by

- "which departments have relatively little impact on other departments within the university and could thus be eliminated without cascading failures?"

Instead, the analysis focuses on identifying departments which are different from other departments at UNL across a variety of metrics intended for discipline-specific comparisons. It is reasonable, for instance, to compare the per-capita grant funding brought in by one Statistics department to the per-capita grant funding brought in by another Statistics department at a different university. It would even be reasonable to compute this quantity for many departments across the country and to assemble a distribution of values or rank the department of interest compared to its peers. However, apart from the SRI metric, which will be addressed separately, this is not what has been done, and it demonstrates a fundamental lack of understanding of the concept of a population:

> a set of similar items or events which is of interest for some question or experiment. A statistical population can be a group of existing objects or a hypothetical and potentially infinite group of objects conceived as a generalization from experience. – Wikipedia, definition of "statistical population"

That is, whoever created the statistical analysis methodology did not account for the fact that all departments in the analysis are not similar. For instance, instructional metrics are computed without regard to whether a department offers service courses at the undergraduate or graduate level (and how many of those courses are offered or required by other departments). This leads to nonsensical comparisons, such as comparing the EDAD department, which is graduate-only and doesn't have service courses, to the English department, which teaches courses at all levels and has many service courses and electives as part of its portfolio. Ultimately, it is not reasonable to expect that the EDAD department would offer undergraduate courses in educational administration, a field that requires a graduate degree (for good reason). Thus, it is also not reasonable to explicitly compare these departments and their constitutent programs and course offerings. As graduate students are only a fraction of the students on campus, it is not reasonable to compare SCH generated at the graduate level in one department to SCH generated at both undergraduate and graduate levels in others.

This problem persists across both research and teaching metrics. SRI, a measure created by Academic Analytics, is perhaps the exception to this rule, but only in that it accounts for discipline-specific norms with respect to research outputs. Unfortunately, UNL's administration used a custom SRI value which compares UNL departments to public AAU institutions, and then took that value and used it to compare UNL departments to each other across discipline boundaries. Section B.4 has more detail on SRI, but the broader issue of comparing numbers across departments which are not fundamentally similar is pervasive throughout both the research and instructional metrics. For instance, grants in English are not similarly sized to those in Physics and Astronomy, Agronomy, or Engineering, because English professors typically do not require large amounts of expensive equipment to complete their research. As a result, it does not make sense to group these departments into the same distribution, which is what the analysis implicitly does by calculating a z-score for each variable.

There is also a clear relationship between the size of the department and its fate under the current budget proposal, as shown in Table B.1. Of the 6 programs proposed for elimination, 5 are in the smallest 10 departments on campus. This suggests that either the administration was specifically selecting small programs for elimination, or that the metrics used to identify candidates for elimination were biased against smaller departments, perhaps unintentionally.

Table B.1: Department Size and Budget Proposal Status

Unit	Size	Status
Broadcasting	4	
Community and Regional Planning	4	Eliminate
Landscape Architecture Program	5	Eliminate
Interior Design	6	
News and Editorial	7	
Classics and Religious Studies	8	
Communication Studies	8	
Textiles, Merchandising, and Fashion Design	8	Eliminate
Agricultural Leadership, Education and Communication	10	Combine (1)
Educational Administration	10	Eliminate
Philosophy	10	
Accountancy	11	
Advertising	11	
Marketing	11	
Architecture	13	
Chemical and Biomolecular Engineering	13	
Global Integrative Studies	13	
Sociology	13	
Statistics	13	Eliminate
Nutrition and Health Sciences	14	
Theatre and Film, Johnny Carson	14	
Modern Languages and Literatures	15	
Economics	16	
Finance	16	
Supply Chain Management and Analytics	16	
Earth and Atmospheric Sciences	18	Eliminate
Management	18	
Plant Pathology	18	Combine (2)
Political Science	18	
Educational Psychology	19	

Unit	Size	Status
Entomology	19	Combine (2)
Child, Youth and Family Studies	20	
Teaching, Learning and Teacher Education	21	
Art, Art History and Design	22	
Chemistry	22	
Agricultural Economics	23	Combine (1)
Architectural Engineering	24	
Food Science and Technology	24	
History	24	
Special Education and Communication Disorders	24	
Biochemistry	25	
Veterinary Medicine and Biomedical Sciences	27	
Civil and Environmental Engineering	28	
Biological Systems Engineering	30	
Mathematics	31	
Mechanical and Materials Engineering	32	
Computing	33	
English	33	
Physics and Astronomy	33	
Psychology	34	
Animal Science	37	
Electrical and Computer Engineering	38	
Biological Sciences	39	
Music	39	
Natural Resources	51	
Agronomy and Horticulture	57	

Smaller departments can have higher variability in year-to-year grant awards, citation counts, and other productivity metrics. Instructional metrics can very easily be thrown off by faculty development or FMLA leave, which does not appear to be accounted for in the FTE metrics[1] Small departments are also far more disrupted by turnover events, because one event in a unit of size 4 or 8 is a large proportion of the unit – and, given that research productivity metrics do not include faculty who have left the unit, a large loss in measured productivity.

The problems with the analysis do not stop with the idea of using the correct comparison group, the lack of consideration for variability in the size of the department. In the eagerness to create the right

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[1]For instance, Dr. Vanderplas was on intermittent FMLA in Fall 2021 after having a baby. She taught a course because the department did not have enough FTE to teach the required courses (hence the "intermittent" FMLA), but the documented expectation was that research would not occur during the 12 weeks of FMLA leave.

combination of values, the analyst conducting this analysis inadvertently did the statistical equivalent of dividing by zero. The resulting variables (this problem is found in both research and teaching metrics) would, statistically, have no estimable mean and infinite variance[2] – which is not what you want if the next step is to take that variable and create a z-score. Ultimately, this z-score contains no information – but by then averaging it with the other research or teaching z-scores, all of the downstream calculations also contain no useful information.

We won't bore you with the statistical proofs and properties, but this is ultimately just one smoking gun suggesting that the metrics used in the analysis are **completely unreliable**.

As this problem affects both the research and teaching metrics, it is the opinion of the department as statisticians (rather than as faculty whose jobs are on the line) that the analysis should be re-done in consultation with a professionally certified statistician (the P-Stat credential is issued by the American Statistical Association).

B.4 Use of Scholarly Research Index

B.4.0.1 Combination of Multiple SRI Values

Some departments have multiple SRI scores generated by Academic Analytics.

In some disciplines, departments might be book-focused or article focused, or might have members with different focuses. Examples in Figure B.1 include Communication Studies, Sociology, Advertising, Landscape Architecture, Interior Design, and Broadcasting, among others.

Another reason a department might have multiple SRI scores is that it is composed of multiple different disciplines. Examples in Figure B.1 include Agronomy & Horticulture, Earth and Atmospheric Sciences, the School of Computing, Physics and Astronomy, and Electrical and Computer Engineering.

When there are two different norms within a discipline, SRI scores were reportedly averaged to create a mean SRI value. This is incorrect - because these values have different distributions, averaging them does not produce a meaningful result with a valid comparison distribution. A more reasonable combination method would be to evaluate each score to get a distributional measure (quantile, percentile, rank), and then to take the maximum of that measure - the departments peers would know what the focus area of the department is and which focus would be more appropriate.

In the case of a hybrid department, the scores were also averaged. This approach is also not reasonable, as SRI distributions are not the same across disciplines. It is critically important to go through the distribution, calculating a rank, percentile, or quantile rather than using averages. Then, if the goal is to

---

[2]Numerical data with this distribution can be averaged, but the average will not converge to anything as the number of observations increases – that is, there is no information that is gained from the averaging process.

Units at UNL, ranked by their standing compared to all AcA – monitored peers
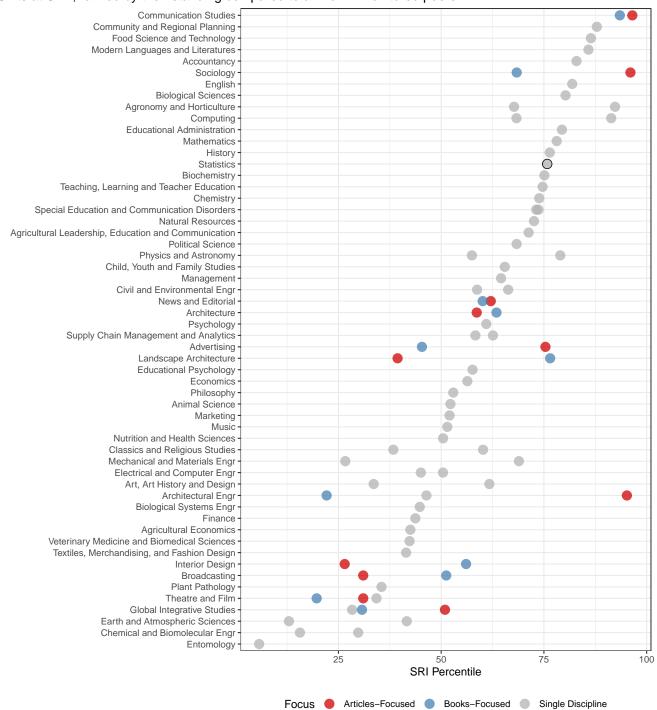
Figure B.1: Some Units at UNL have multiple SRI values, either because different departments focus on books or articles within the discipline, or because departments have faculty from multiple disciplines.

99

assess the department's performance, two reasonable approaches could be used to aggregate the percentile or quantile scores:

- take a weighted average of the percentile or quantile scores, with weight determined by the composition of the department.
- take the maximum of the percentile or quantile scores in order to assess the overall opinion of the work done within the department in a community of peers. This makes more sense if the goal is to model how other people see UNL's departments, as people tend to remember outstanding work in the field more than they remember or consider average work.

B.5 Problems with Overall Z-scores

The UNL research z-score is created by standardizing each input measure with respect to all departments on campus before computing an unweighted average of each component z-score to form a single research index for each department. This is fundamentally problematic, as the SRI measure used by academic analytics not only incorporates many of the components used (federal expenditures, awards, books, citations), but also because the discipline-specific weightings are intended to allow for comparison within-disciplines, and they are being used here as a cross-discipline comparison. That is, the z-score method indicates a fundamental misunderstanding of both the Academic Analytics (and AAU) metrics and the appropriate use of statistical methods. It would be quite reasonable to use the SRI percentile for each department, which compares the department's research reputation relative to other departments in the same area, compute a normal quantile from the percentile, and then use that z-score to represent the department's research reputation. This would also allow for use when averaging z-scores from other research metrics to produce a single research summary; which is a practice that is reductive and not particularly effective, but is also not definitively wrong.

More problematic is the use of standardization on variables that are ratios – in particular, those which might be expected to have a 0/0 form in distribution. That is, in both research and teaching, some quantity is observed at two different time points for a department and for the university as a whole. The difference between time points is then made into a ratio of department difference divided by university difference. Without strong assumptions about the increase in grant funding or instructional SCH, the reasonable way to model this quantity would be to assume that the mean at each time point is the same, leading to a 0/0 expected value (mean), which is undefined mathematically. This distribution has no mean and does not have finite variance, which is only complicated by the immediate standardization of these variables to create a z-score. Ultimately, this contaminates both instructional and research z-score averages, because **everything this type of variable touches becomes not-estimable**.

As a result, **both the research and teaching z-scores are statistically meaningless** - they do not provide any information on the departments, because of the properties of distributions which have no mean

and no variance due to (essentially) dividing by zero. Relying on these metrics to inform decisions is fundamentally incorrect and essentially ensures the decision will be at best random, and at worst systematically biased.

B.6 Custom UNL Research Metrics

Moving past SRI, however, it is clear that there was some attempt to create a secondary SRI-like index with UNL data that accounts for some of the holes in Academic Analytics. There are many well known issues with Academic Analytics: only some journals are indexed, only NSF and NIH grants count for federal funding, excluding USDA, NIJ, DOE, NIST, and other sources of federally funded grant money, and only certain discipline-specific awards are counted as prestigious.

However, while UNL insists they did not weight the metrics used (as if that is an indication of unbiasedness), the number of variables measuring similar dimensions of research productivity certainly create an implicit weighting.

There are three different indicators of grant budget contributions. It's unclear why the `total_sponsored_awards_i` indicator was divided by total state appropriated budget, but the numbers for Statistics grants do not seem to be in the right ballpark. For instance, if we multiply the 0.362 value for statistics (before it is converted to a z-score) by the state permanent budget from 2025-26, we get 4.8118524×10^5. One PI in the department brought in 1.2 million dollars in grant money during the 2020-2024 period, so we can .

`research_awards_growth_inc_nuf_fy20_fy24` looks at the percentage of growth of grant money attributable to the unit. Given that the grant totals are unreliable, it isn't surprising that this percentage is also off, but the fact that the statistics department number is -455843.15 suggests that this isn't a percentage at all and that there are some fundamentally problematic calculation errors (or the codebook is wrong, which also seems possible, particularly given the duplication of the entries for the last two research metrics).

`p1_expenditures_normalized` seems to include some of the information in `total_sponsored_awards_inc_nuf_rs` which would double-count the awards from NSF and NIH indexed by Academic Analytics (in addition to counting them a third fractional time via SRI). However, again, these numbers do not seem to be calculated as described. We cannot find any evidence of accounting for faculty members with secondary appointments in the department, nor can we make the numbers generated for Statistics make sense given our self-reported data.

`awards_normalized` would be directly reported by Academic Analytics and is already accounted for in the SRI metric. It is clear that the codebook was not checked for correctness by administration, either, given that the normalization is reported twice - it is unclear whether we to calculate this by dividing by the squared TT-FTE metric or by just the number of TT FTEs in the department. This metric is likely to be highly influenced by time in role and years since Ph.D., disadvantaging departments which are relatively young compared to those with a higher percentage of full professors. It should also be noted that not all

professional organization awards are indexed by Academic Analytics, which represents a systematic bias when this metric is used to compare across departments and disciplines.

`books_normalized` is again Academic Analytics data that has been factored into SRI already. This data is publisher reported, and not always correct (one member of our department had the 2nd edition of his book reported as having the year of the first edition, so it just doesn't count). As some disciplines do not preference books and instead publish articles or conference papers, using this metric to compare across disciplines (via z-score calculation) is absolutely preferencing book-focused departments.

`citations_normalized` has the same description as `books_normalized`; however, the numbers are not the same, so we presume this also uses Academic Analytics data for citations. Going into Academic Analytics, the citation data appears to include citations from journals which Acad Analytics indexes to journals which Acad. Analytics indexes, where the journal article was published between 2020 and 2023 and the citation occurred between 2020 and 2023. This is again a highly discipline-dependent metric – in fast-moving disciplines, such as Computer Science, a good paper will be cited many times within the first six months, while in slower disciplines, a paper might not be cited until 3 years later.

What is not included in UNL's custom metrics is just as telling as what is included: they do NOT include any measure of articles published (beyond citations) and they don't include any measures of conference papers published. This has the effect of biasing the metrics toward book-centric disciplines at the expense of article centric disciplines. When combined with the fact that grant award totals vary widely between disciplines (for instance, Statistics doesn't require any lab equipment or supplies, so grants tend to fund students, travel, and summer salary), the metrics assembled by UNL are fundamentally unsuitable for cross-discipline comparisons. Pitting departments against each other using these metrics could be the result of a lack of understanding of statistics, or it could be that the metrics were assembled to produce a specific set of acceptable outcomes. In either case, however, it does not reflect particularly well on the UNL administration.

C A Statistical Commentary on the Metric Inputs and Calculations

This section contains a reorganized version of the code book provided to departments. The code book describes how the various measures used to evaluate departments were assembled and calculated. Measure definitions have been rearranged to form coherent categories (the original document is difficult to follow in part because derivative measures are sometimes not close to their inputs).

> ⚠ **Warning 1**
>
> Comments on the validity of various measures are contained in highlighted blocks to differentiate them from the official metric definitions. In most cases, these comments are focused on the problems discovered by the Statistics department, however, it seems likely that most issues cut across many departments.

C.1 General Descriptors

C.1.1 Identifiers

1.1.1 `lowest_level_key` Numeric key of lowest level unit.

1.1.2 `lowest_level_short_name` Short name of lowest level unit.

1.1.3 `lowest_level_name` Full name of lowest level unit.

1.2 `vcvp` Vice Chancellor that unit belongs to: EVC or IANR.

1.3 `college` College for units that belong to a college.

1.4 `department` Department for units that belong to an academic department.

1.5 `has_finance_org` Indicator variable: 1 if the unit has a financial org, 0 otherwise.

1.6 `has_acad_org` Indicator variable: 1 if the unit has a academic org, 0 otherwise.

1.7 `has_hr_org` Indicator variable: 1 if the unit has a HR org, 0 otherwise.

1.8 `acad_end_year` Academic ending year. E.g., 2024 for 2023-2024 AY.

C.1.2 Budget

1.17 `original_sa_budget` Original state-aided budget (total). Original budget includes all permanent funding as of July 1. Temporary funding and cash carryforwards are excluded. This also shows up at Budget in final metrics.

1.18 `original_sa_budget_gse` Original state-aided budget with General State-Aided fund subtype.

1.19 `original_sa_budget_dt` Original state-aided budget with Differential Tuition fund subtype.

1.20 `original_sa_budget_poe` Original state-aided budget with Programs of Excellence fund subtype.

1.21 `original_sa_budget_other` Original state-aided budget with other fund subtypes, including Distance Education, Facilities & Administrative, Tobacco and etc.

1.32 `teaching_outlay` Appointment budgeted salary * appointment teaching apportionment (%) summed for unit.

1.95 `instruction_budget` Original state-aided budget multiplied by teaching fte as a percentage of total fte for unit.

1.33 `research_outlay` Appointment budgeted salary * appointment research apportionment (%) summed for unit.

1.96 `research_budget` Original state-aided budget multiplied by research fte as a percentage of total fte for unit.

1.34 `service_outlay` Appointment budgeted salary * appointment service apportionment (%) summed for unit.

1.97 `service_budget` Original state-aided budget multiplied by service fte as a percentage of total fte for unit.

1.35 `extension_outlay` Appointment budgeted salary * appointment extension apportionment (%) summed for unit.

1.98 `extension_budget` Original state-aided budget multiplied by extension fte as a percentage of total fte for unit.

1.36 `admin_outlay` Appointment budgeted salary * appointment administration apportionment (%) summed for unit.

1.99 `admin_budget` Original state-aided budget multiplied by admin fte as a percentage of total fte for unit.

1.72 `budget_from_evc_file_state_appropriated_budget` State-aided budget.

1.991 `total_realizable_base_tuition_less_budget` This is estimated by `total_realizable_base_tuition` (1.49) less original state-aided budget, apportioned for `percent_teaching` (also `instruction_budget`, see 1.95 above).

C.1.3 Appointments & Headcount

> ⚠️ **Warning 2: Apportionment problem: Partial-year data not included**
>
> This information seems to have been assembled from a source that does not take into account mid-year hires. Susan Vanderplas started at UNL in January 2020 and has a 20% Extension appointment, so for the 2019-2020 academic year, she would have been paid for between 5 and 6 months, depending on how 9-month contracts are handled. The Details tab of the metrics show a 0.0 percent extension FTE appointment for 2020, with subsequent years matching the 0.200 in the appointment.

> ⚠️ **Warning 3: Headcount problem: Lack of Public Data Confirmation**
>
> There is relatively little clarity to be had about how apportionment was counted in these metrics. The only public data available to us is the UN System Budget & Salary Information, which contains spreadsheets ("Budgeted Employees as of…") and PDF documents ("University of Nebraska Salary Information"). Historical data is available.
>
> The salary **spreadsheets** appear to show the cost distribution for a position (e.g. where the money comes from), but only when the position is more complicated than just having funding from multiple departments indicating a partial appointment, as shown in Figure C.1. This happens most frequently when someone has administrative responsibilities in addition to standard research or teaching responsibilities.

1	Employee	Position	Campus	Department	Salary	Fund	Other Fund
2705	Davidson, Jennifer A	Nebraska Bankers Assoc Faculty Fellow	UNL	Economics	5000		5000
2706	Davidson, Jennifer A	Associate Professor of Practice	UNL	Economics	47583	47583	
2707	Davidson, Jennifer A	Director	UNL	Economic Education	55717		55717

Figure C.1: An example of someone with multiple salary sources – a fellowship, a normal professor salary, and a director position that comes from non-state-aided funds.

> The **PDF tables of salary information** show a set of information that sometimes matches, but

sometimes does not.

511000	Davidson, Jennifer A	Associate Professor of Practice	03193	095166	02	0.510	47,583
	Nebr Council on Economic Educ General Fu (27-7490-0031001) 511000					0.000	5,000
	Nebr Council on Economic Educ General Fu (27-7490-0031001) 512100					0.490	55,717
	TOTAL Davidson, Jennifer A					**1.000**	**108,300**

Figure C.2

It seems *likely* that the proportions in the FTE column (next from the last) of Figure C.2 would represent the apportionment, but that doesn't seem to always match what the individual understood their apportionment to be. When apportionments change, the university is supposed to provide written notice of the new contractual arrangement and it should be signed. In at least one case in Statistics, we could not find paperwork to match the effort allocation reported in the PDF FTE column. More importantly, however, it seems that the FTE column in the PDF doesn't match the information assembled by the office of research and innovation to allocate research productivity to departments.

What this boils down to is that the Statistics department cannot get administration to explain why their numbers for people (and fractional people) in the department don't match the administrations numbers. That is, we don't even count department members the same way! Note that the individuals in question are longstanding members of the department who have e.g. taught Statistics courses, advised students, served on hiring committees - this issue spans most of the decade of research productivity metrics, and as a result, the impact cannot be assumed to be insignificant.

Perhaps if we could get data which matches our paperwork (if those columns exist in a database) and compare the different metrics, it would be possible to agree on a standard methodology for apportioning research productivity. These decisions happen in every data analysis, but we teach our students to (1) document the options which existed, (2) justify their selection of a particular option, and (3) conduct a sensitivity analysis after the analysis to see how much the results change based on the selection of a different way to measure a variable. The Office of Research and Innovation apparently did not do any of these things – and they also will not provide us with the data to validate their numbers ourselves.

1.9 `appointment_apportionment_fte` Total apportioned FTE across all appointments.

1.10 `appointment_apportionment_percent_teaching_fte` Sum of faculty teaching apportionment by appointment times FTE by unit.

1.11 `appointment_apportionment_percent_research_fte` Sum of faculty research apportionment by appointment times FTE by unit.

1.12 `appointment_apportionment_percent_service_fte` Sum of faculty service apportionment by appointment times FTE by unit.

1.13 `appointment_apportionment_percent_extension_fte` Sum of faculty extension apportionment by appointment times FTE by unit.

1.14 `appointment_apportionment_percent_admin_fte` Sum of faculty admin apportionment by appointment times FTE by unit.

1.15 `total_instructor_fte` Sum of `appointment_apportionment_fte` by unit.

> ⚠️ Warning 4: Instructor FTE Problem
>
> This metric definition doesn't make any sense. There is a single column of `appointment_apportionment_fte` for each unit.
> If instead, this is intended to mean the sum of `appointment_apportionment_percent_teaching_fte` through `appointment_apportionment_percent_admin_fte`, it doesn't make sense either, because those values should sum to `appointment_apportionment_fte` instead.
>
> Table C.1: Top and Bottom 15 departments by ratio of total instructor FTE to appointment apportionment FTE. Only departments with nonzero total instructor FTE are included.
>
> Table C.1: Top and Bottom 15 departments by ratio of total instructor FTE to appointment apportionment FTE. Only departments with nonzero total instructor FTE are included.
>
> | Rank | Dept | Ratio |
> |---|---|---|
> | 1 | Agricultural Leadership, Education and Communication | 8.802 |
> | 2 | Glenn Korff School of Music | 8.375 |
> | 3 | Broadcasting | 6.091 |
> | 4 | Program in English as a Second Language | 6.000 |
> | 5 | School of Global Integrative Studies | 5.729 |
> | 6 | Textiles, Merchandising & Fashion Design | 5.479 |
> | 7 | Johnny Carson School of Theatre & Film | 5.204 |
> | 8 | Advertising & Public Relations | 4.915 |
> | 9 | School of Biological Sciences | 4.698 |
> | 10 | School of Art, Art History & Design | 4.548 |
> | 11 | Journalism | 4.450 |
> | 12 | Durham School of Architectural Engineering & Construction | 4.323 |
> | 13 | Modern Languages & Literatures | 4.275 |
> | 14 | Educational Administration | 4.187 |
> | 15 | Classics & Religious Studies | 4.140 |
> | ... | | |
> | 49 | Earth and Atmospheric Sciences | 1.847 |
> | 50 | Mathematics | 1.844 |

51	School of Veterinary Medicine and Biomedical Sciences	1.797
52	Chemistry	1.658
53	Statistics	1.533
54	Animal Science	1.533
55	Entomology	1.484
56	Biochemistry	1.480
57	Women's & Gender Studies	1.441
58	Agricultural Economics	1.236
59	Physics & Astronomy	0.821
60	Plant Pathology	0.537
61	School of Natural Resources	0.390
62	Center on Children Families & the Law	0.269
63	School of Veterinary Medicine and Biomedical Sciences	0.183

It is not clear what this is measuring, but departments which seem to have more extension-focused non-teaching appointments seem to be lower on the list. Departments which have more professors of practice seem to be higher on the list.

1.37 `percent_teaching` sum(appointment_apportionment_percent_teaching_fte) / sum(appointment_appo... for unit. This is set to zero when there is no teaching apportionment.

1.38 `percent_research` sum(appointment_apportionment_percent_research_fte) / sum(appointment_appo... for unit. This is set to zero when there is no research apportionment.

1.39 `percent_service` sum(appointment_apportionment_percent_service_fte) / sum(appointment_apport... for unit. This is set to zero when there is no service apportionment.

1.40 `percent_extension` sum(appointment_apportionment_percent_extension_fte) / sum(appointment_ap... for unit. This is set to zero when there is no extension apportionment.

1.41 `percent_admin` sum(appointment_apportionment_percent_admin_fte) / sum(appointment_apportionm... `for unit`. This is set to zero when there is no admin apportionment.

1.66 `t_tt_headcount_2014_2023_avg` The average of the full-time employees with faculty status who are on the tenure track or tenured as reported to the National Center for Education Statistics IPEDS Data Center. Headcounts were assigned to departments using the HR tenure org unit.

> **⚠ Warning 5: Research Contributions by NTT Professors**
>
> Our department had a long-time Professor of Practice, Kathy Hanford, who had a research and teaching apportionment and was the professor in charge of the SC3L. She retired at the end of 2023, so she *should* be included in most of our metrics, but isn't because she was not tenure track. She does, however, count against our budget. Her research productivity, grant productivity, and collaborations across campus should count when evaluating the department's importance within UNL, but they do not currently. The focus on tenure track positions to the exclusion of all others is incredibly damaging, particularly when a department is as small as we are. If Kathy had been hired more recently, the position would have likely been tenure track (and when the position was posted to find her replacement, it was posted as tenure track). The current head of SC3L, Dr. Reka Howard, is an associate professor in the department.

> **⚠ Warning 6: Per-capita measures**
>
> Different denominators are used to measure per-capita productivity in teaching and research across the analysis. In some cases, these are reasonable (e.g. it is reasonable to use total teaching FTE to calculate SCH per FTE values), but in others, these differences seem to arise primarily from the desire to conform to Academic Analytics or AAU metrics. While it is understandable that our administration wants to use metrics from other organizations rather than develop their own (this document exists because they don't have the statistics training to design effective measures of variables of interest), this leads to significant and strange differences in productivity measures. It would be a far more coherent overall **analysis** if admin had used a single set of FTE measures consistently, rather than switching these measures up for different variables.

1.50 `vsip_eligible_n` The count of VSIP-eligible tenure-track faculty as of summer, 2026. If this follows past methodology, this is the count of faculty who:

- are tenured
- are 62 years of age as of their eligibility date: June 30, 2026 (FY contract length) or August 27, 2026 (AY contract length)
- have 10 years of service as of their eligibility date

This is an estimate. At present, it is impossible to determine how many would meet the final criterion: No accepted retirement contract/letter in place.

1.51 `vsip_eligible_pct` The proportion of the unit's tenure-track faculty who would be eligible for VSIP in summer, 2026.

> ⚠️ Warning 7: VSIP percentage
>
> Tracking this makes sense, but it's unclear how this metric might factor into a final decision to combine or eliminate departments. Is it better to eliminate a department with a high percentage of VSIP eligible faculty, since the department might not be able to function after VSIP anyways? Or would it be better to eliminate a department without VSIP eligible faculty, since those savings won't be double-counted by both VSIP and the elimination of the department, as the current analysis seems to do for the departments which will be combined (ALEC and Agricultural Economics, Entomology and Plant Pathology).

C.2 Research

> ⚠️ Warning 8: Z-scores for research
>
> There are so many problems with the constitutent components of the research metrics (even before they are standardized) that the resulting research average z-score is utterly unreliable and not useful for cross-department comparison.
> Fundamentally, as statisticians, if you take the average of standardized garbage, you still get garbage. Garbage in, garbage out, or GIGO, is a fairly standard abbreviation used to describe this problem.

1.57 `research_average` (Research Average z-score) Average research z-score with non-departmental units (including Dean's offices) removed.

1.58 `research_avg_z_score_equally_weighted` Alternate calculation of research average with non-departmental units included in population with zero research productivity.

1.83 `comments` Comments from ORI regarding research metrics, their crosswalk to instructional units, etc.

C.2.1 SRI

1.82 `sri_aau_public_peers` Academic Analytics SRI score when comparing units to Public AAU Institutions. If a unit has multiple SRI scores available, they were averaged.

> The Scholarly Research Index (SRI) is a measure developed by Academic Analytics to evaluate the research performance of individuals and entities with respect to
>
> 1. scholarly products, such as conference proceedings, research articles, books, and book chapters,

2. recognition from the community in form of citations and awards, and

3. federal sponsoring of research projects measured by the number of grants and their amounts.

Different disciplines operate differently. The weighting of each of these measures is therefore adjusted discipline specific (based on a factor analysis by Academic Analytics).

1.59 `sri_aau_public_peers_z_score` Z score of sri_aau_public_peers

> ⚠️ Warning 9: SRI Problem 1 - Averaging Multiple SRI scores
>
> Some departments have multiple SRI scores generated by Academic Analytics.
>
> In some disciplines, departments might be book-focused or article focused, or might have members with different focuses. Examples in Figure B.1 include Communication Studies, Sociology, Advertising, Landscape Architecture, Interior Design, and Broadcasting, among others.
>
> Another reason a department might have multiple SRI scores is that it is composed of multiple different disciplines. Examples in Figure B.1 include Agronomy & Horticulture, Earth and Atmospheric Sciences, the School of Computing, Physics and Astronomy, and Electrical and Computer Engineering.
>
> When there are two different norms within a discipline, SRI scores were reportedly averaged to create a mean SRI value. This is incorrect - because these values have different distributions, averaging them does not produce a meaningful result with a valid comparison distribution. A more reasonable combination method would be to evaluate each score to get a distributional measure (quantile, percentile, rank), and then to take the maximum of that measure - the departments peers would know what the focus area of the department is and which focus would be more appropriate.
>
> In the case of a hybrid department, the scores were also averaged. This approach is also not reasonable, as SRI distributions are not the same across disciplines. It is critically important to go through the distribution, calculating a rank, percentile, or quantile rather than using averages. Then, if the goal is to assess the department's performance, two reasonable approaches could be used to aggregate the percentile or quantile scores:
>
> - take a weighted average of the percentile or quantile scores, with weight determined by the composition of the department.
> - take the maximum of the percentile or quantile scores in order to assess the overall opinion of the work done within the department in a community of peers. This makes more sense if the goal is to model how other people see UNL's departments, as people tend to remember outstanding work in the field more than they remember or consider average work.

> ⚠ **Warning 10: SRI Problem 2 - Cross-Department Comparisons**
>
> It is **completely inappropriate** to use SRI values to compare departments to other departments within the same university. SRI values have a distribution that is discipline specific, with different means and variances. As-is they are not comparable outside of that distribution, as shown in Table C.2

Table C.2: Departments at UNL with an SRI of 0.4 (calculated using all AcA universities), but with considerable variance in SRI percentile. Note that while the SRI values and percentiles would be different if the comparison population were limited to public AAU universities, the concept is still important. Changing or reducing the comparison population only changes how many universities are available for eCDF estimation and percentile calculation and shifts the population mean and variance to some degree.

Unit	SRI	SRI Percentile	Number of Units	SRI Rank
Agronomy and Horticulture, Department of	0.4	92.31	26	3
Computing, School of	0.4	91.38	325	29
Modern Languages and Literatures, Department of	0.4	85.84	219	32
Accountancy, School of	0.4	82.93	205	36
Educational Administration, Department of	0.4	79.38	160	34
Statistics, Department of	0.4	75.80	157	39
Teaching, Learning and Teacher Education, Department of	0.4	74.68	79	21
Special Education and Communication Disorders, Department of	0.4	73.68	95	26
Agricultural Leadership, Education and Communication, Department of	0.4	71.28	94	28

Calculating a mean and standard deviation to create a z-score for SRI values across disciplines destroys any information which could have been found in the SRI measure.

Note that this is *not* an objection to SRI as a concept. It seems that SRI is a more fair method of comparison than other attempts to replicate SRI used in the budget reduction process, because at least all departments across a discipline are compared using the same (sometimes flawed) data[1]. As it is, the metrics assembled by UNL, while applied to all departments equally, have unequal effects on different departments because the metrics used favor one discipline over another due to norms within that discipline. The problem with SRI is that it must be used in the context for which it was intended: comparing departments to other similar departments. The misuse of SRI results in eliminating programs which compare perfectly well to both Academic Analytics institutions and to AAU peers, as shown in Figure 4.1.

While we do not have access to the complete data for all departments and their comparison units, we do have access to the statistics data, which is shown in Figure 4.2. The statistics department's SRI value is at the top of the non-AAU R1 institutions, and is well within the bounds of the SRI range of AAU institutions. Note that we would not expect that a department be at the top of the AAU university SRI values (which is why the custom SRI score isn't that useful, though the percentile is somewhat helpful) – what is necessary is for the department's SRI to be above the minimum (preferably comfortably above) of the comparable AAU department SRI values.

Problem Under the UNL proposed method (using the SRI relative to public AAU institutions), it seems that custom SRI is used instead of percentile. This renders any calculations done on SRI, and any calculations which use `sri_aau_public_peers` or `sri_aau_public_peers_z_score`, functionally meaningless as they are not comparing values drawn from the same distribution to each other. Without a common reference distribution, it is inappropriate to pool values by calculating a common mean and variance, and then to use that common mean and variance to produce a z-score.

Solution SRI should be converted to a percentile (or corresponding quantile, if the goal is a z-score), and in disciplines without sufficient comparison departments, there will be a lot of variability in the percentile (which should be treated as an estimate). SRI should be used to evaluate research productivity instead of attempting to create a multi-metric that adds additional weight to awards, books, citations, and grants x3, as Academic Analytics has already done the factor analysis to determine which of these are relevant to which disciplines.

Theory & Statistical Rationale The Glivenko-Cantelli theorem guarantees that as $n \to \infty$ the empirical CDF (eCDF) converges to the distribution CDF demonstration via WolframAlpha. While there is no guideline for sufficient n, the eCDF will be extremely blocky and step-function like at first, and as n increases, the average distance between discontinuity points will decrease, producing an increasingly smooth function. The variance of the estimated percentile can be estimated by treating the percentile as a proportion and using a binomial confidence interval to get a sense of the variability. Then, this binomial confidence interval can be mapped back to normal quantiles if a z-score range is desired.

---

[1] Academic Analytics analysts are very aware of the flaws in their data. If UNL wants to improve as an institution, one way to

> **⚠ Warning 11: SRI Problem 3 - Comparison Groups and TMFD**
>
> The case of Textiles, Merchandising, and Fashion Design illustrates the problem of comparison groups quite nicely. TMFD is in the bottom quintile - ranked 25 out of 41 peers - in Figure 4.1. Except the department should have 127 peers, because every land-grant university has a similar department. Looking more closely, we find that the peer group for the department in Academic Analytics is listed as "Consumer and Human Sciences, various". Word of caution: whenever someone describes your work as 'something with', 'various', or 'whatever', they don't really know what you are doing. So why doesn't Academic Analytics know what TMDF does?
>
> Academic Analytics uses CIP (Classification of Instructional Programs) codes defined by the National Center for Education Statistics to create peer groups. Merely glancing over the Textile related cip codes, it is clear that there are more fitting choices than 'Consumer and Human Sciences, various':

facilitate that would be to have PIs to ask e.g. federal grant agencies other than NIH and NSF to report data to Academic Analytics, as this would likely help us. Another option is for UNL to actually talk to analysts at Academic Analytics and to ensure that UNL follows statistical validation procedures that are as well thought out as AcA's procedures.

CIP Code	Program Name
19.0901	Apparel and Textiles, General
19.0902	Apparel and Textile Manufacture
19.0904	Textile Science
19.0905	Apparel and Textile Marketing Management
19.0906	Fashion and Fabric Consultant
19.0999	Apparel and Textiles, Other

So why does Academic Analytics not pick a better peer group for comparisons?
It turns out, that Academic Analytics relies on the submitting organization to provide CIP codes:

> CIP Codes (to units and Ph.D. programs as classified in institution's system) Note that while CIP Codes are referenced in the creation of the Academic Analytics Taxonomy and are requested in the submission instructions, they are currently used for reference only. Reporting by CIP is not available. Not all requested fields are available in the comparative database. Some data remain incomplete because institutions have not submitted those fields. However, they are archived because they may prove useful for clients and Academic Analytics, particularly in the data matching processes.

So, at some point someone at UNL listed TMFD as "Consumer and Human Sciences, various" instead of the proper CIP code, and it is TMFD's job to find the error, get someone in ORI to listen to the problem and fix the error, and then hope that the metrics are updated before their APC hearing. Ultimately, there just is not enough time for that process to occur, even if ORI was willing to engage and fix the analysis.

C.2.2 Awards

1.68 `awards_ltd_2023_total` NCR highly prestigious awards, including national academy memberships in engineering, medicine and science. The data source AAU uses for highly prestigious awards is Academic Analytics (AcA) and only awards for T/TT faculty in benchmarked AcA units is reported to the AAU. Highly prestigious awards are tracked over the life of the faculty member's career and are credited to the institution where they are currently employed. Once a faculty member retires or leaves an institution, their highly prestigious awards are no longer included in the data reported to AAU. Put another way, the highly prestigious awards follow the faculty member. From the AAU Membership Policy: AAU collects the number of faculty members by institution receiving awards, fellowships, and memberships in the National Research Council (NRC) list of highly prestigious awards that included: research/scholarship awards, teaching awards, prestigious fellowships or memberships in honorary societies. Each data year represents the faculty's lifetime honors and awards, not new honors and awards. University of Maryland, College Park data includes Univer-

sity of Maryland, Baltimore beginning in 2019. The Faculty Scholarly Productivity (FSP) Database. These data are reproduced under a license agreement with Academic Analytics. http://academicanalytics.com/ . The list of the NRC highly prestigious awards can be found at: National Research Council List of Highly Prestigious Awards | Association of American Universities (AAU). Memberships in the National Academies (NAS, NAE, NAM) compiled from the membership lists of each academy; lists can be found at: National Academy of Sciences: http://www.nasonline.org/member-directory/, National Academy of Engineering: http://www.nae.edu/default.aspx?id=20412, National Academy of Medicine: https://nam.edu/directory-search-form/

> ⚠️ **Warning 12**
>
> Award comparisons should be made within discipline, not across disciplines, as the AAU list of prestigious awards does not include the AERA awards for education. As the national academies listed do not induct professors teaching in education, it is irrational to compare e.g. the physics department, whose members could conceivably be inducted into the NAS, NAE, or both depending on the subfield. This is one reason why Academic Analytics compares within discipline and not across disciplines.

1.79 `awards_normalized` `awards_ltd_2023_total` divided by `t_tt_headcount_2014_2023_avg`.

1.63 `awards_normalized_z_score` Z score of `awards_normalized` Normalized highly prestigious awards, fellowships and memberships as defined by the AAU membership policy for awards received LTD up to 2023. Data is normalized by the average T/TT faculty headcount over the same time period as reported to IPEDS.

C.2.3 Books

1.69 `books_2014_2023_total` The total number of books published over the time period 2014-2023. The data source AAU uses for highly prestigious awards is Academic Analytics (AcA) and only books published for T/TT faculty in benchmarked AcA units are reported to the AAU. Book publications reported to AAU by AcA include books, casebooks, edited volumes, encyclopedias, and textbooks. AcA book types not reported include journals, proceedings, study guides and book chapters. Book publications are credited to departments based on the author's HR tenure org unit. From the AAU Membership Policy: The total number of books published by the institution for the most recent ten-year period. The Faculty Scholarly Productivity (FSP) Database. These data are reproduced under a license agreement with Academic Analytics. http://academicanalytics.com/

1.80 `books_normalized` `books_2014_2023_total` divided by `t_tt_headcount_2014_2023_avg`

1.64 `books_normalized_z_score` Z score of `books_normalized` Normalized book publications as defined by the AAU membership policy for the time period of FY2014 to FY2023. Data is normalized by the average T/TT faculty headcount over the same time period as reported to IPEDS.

> **⚠ Warning 13: Book Disciplines and Book Data**
>
> While the book data from Academic Analytics is overall quite high quality, it does have some issues in that it is dependent on publisher reporting. The statistics department found at least one book which was misreported by the publisher, affecting the totals. More importantly, individuals do not have access to Academic Analytics – typically, only unit leads have access. Unit leads have neither the time nor the precise information to audit this information for correctness and follow up to ensure that it is fixed. These errors are likely more consequential for small departments, particularly in disciplines that are not book-centric as measured by Academic Analytics weights.
>
> Books published by faculty members in the department during the decade-long interval are not included if the faculty member left the department or retired before 2024, despite the fact that these individuals contributed to the reputation of the department during the decade of interest. Dr. Walter Stroup published 3 extremely well-respected and popular books between 2014 and 2023, but these are not counted in the department metrics, even though Dr. Stroup was a past chair of the department and is an important part of our reputation for excellence, even after his retirement.
>
> In addition, books are normalized by average tenure-track headcount without accounting for apportionment. Most (but not all) books published are research-centric, with textbooks as the exception. However, even textbooks are typically written while on research leave. As a result, it is probably more reasonable to normalize this value by average research FTEs rather than average number of tenure-track FTEs.

C.2.4 Citations

1.70 `citations_2014_2023_avg` The average number of citations on peer-reviewed articles for the most recent ten-year period. AcA reports citations in the year of the publication. Citations for articles coauthored by more than one UNL faculty member have been split equally across authors. AAU uses Web of Science InCites for the citations data. UNL does not currently subscribe to InCites and so is using Academic Analytics to track and report this data. Citations are credited to departments based on the author's HR tenure org unit. From the AAU Membership Policy: Average number of times an institution's Web of Science Documents have collectively been cited for the most recent ten-year period. InCitesTM, Clarivate (2023). Web of Science. ® These data are reproduced under a license agreement from Clarivate. http://incites.clarivate.com/

> **⚠ Warning 14: Citation Window**
>
> The choice to use Academic Analytics citations is not discipline-neutral. The InCites citation window is 10 years, which is long enough for most disciplines. However, Academic Analytics citation counts for the statistics department are lower than the corresponding citation counts from InCites – 77 vs. 127 for Susan Vanderplas, for example. In some disciplines (statistics, math), papers can reach

peak average citation frequency after 15 years or more (Galiani & Galvez 2017).

> Galiani, Sebastian and Gálvez, Ramiro H., The Life Cycle of Scholarly Articles Across Fields of Research (May 2, 2017). http://dx.doi.org/10.2139/ssrn.2964565

When interpreting 10-year citation counts, it is also important to consider the age of the department. For instance, consider Dr. Vanderplas, who received her Ph.D. in 2015. It is unlikely that she had any highly cited papers before she received her Ph.D., and even unlikely in the years immediately after receiving her Ph.D., as young researchers are often not cited as frequently as more established colleagues. A department made up of primarily assistant and associate professors will be at a very large disadvantage relative to more established departments. If the number of people in the department is also small, the variability in citation counts also becomes a factor.

1.81 `citations_normalized` `citations_2014_2023_avg` divided by `t_tt_headcount_2014_2023_avg`.

> ⚠️ Warning 15: Citation normalization
>
> Normalizing citations by tenure-track headcount instead of by effective research FTE is problematic. Some departments have a significant number of non-TT faculty in research/extension positions who contribute to the scholarly literature in their field. In addition, some departments have a vastly different apportionment between research and teaching, and this would translate into different publication rates and accumulation of citations.
>
> These factors are more critical when they are used to compare across departments within a university – when Academic Analytics makes comparisons using tenure-track headcount, that leaves out some information, but it would be expected to hurt similar departments similarly. This is not the case when using these metrics to compare across departments – in these situations, discipline specific norms must be accounted for in some way.

1.65 `citations_normalized_z_score` Z score of `citations_normalized` Normalized citations as defined by the AAU membership policy (using Academic Analytics as a proxy for InCites) for the time period of FY2014 to FY2023. Data is normalized by the average T/TT faculty headcount over the same time period as reported to IPEDS.

> ⚠️ Warning 16: Citation counts
>
> Citation counts differ wildly by discipline, and are affected both by how many researchers and papers there are in the discipline and by citation norms within that discipline. Using z-scores makes the assumption that all departments are from a similar distribution (which is clearly not the case). Comparing departments on normalized citations ensures that these discipline-specific norms dominate the signal, which biases a metric that might have been intended to indicate department research quality

and reception so that it just becomes a signal for citation norms and research appointment practices.

C.2.5 Research Awards Inc NUF

⚠ Warning 17: Grant Metric Problems

All of the grant metrics are affected by a common flaw: disciplines do not (usually) compete against each other within a university for awards[2]. Rather, the English department might get awards from the National Endowment for the Arts or various private foundations. The Physics department likely gets grants primarily from NSF, and Engineering departments have some options - NSF, Dept of Energy, Department of Defense. Life sciences might get grants from NSF, but also NIH, CDC, Dept of Health, and the Veterans Administration. Agriculture grants will primarily come from USDA but may also come from NSF, NIH, and others because ultimately agriculture spans both applied and hard science topics across a wide range of applications.

What is important about this is that the amount of funding available (and size of available grants) is dramatically different between departments. That is, departments cannot be thought of as one single population! It is clear that someone putting these metrics together paid enough attention in a statistics class to remember how to compute a z-score, but apparently they missed the part where it makes no sense to compute z-scores when you don't have a defined reference population. Or, in this case, when you absurdly claim that something that is clearly a mixture of several populations can be used as a single reference population.

Ignoring population heterogeneity (having multiple groups with different values in a population) is a common precursor to Simpson's paradox, where a trend of the overall data reverses direction once the groups are accounted for in the model. Without the raw data for the individuals across the university, we cannot conclusively demonstrate that this is what is happening, but it seems possible. Alternate explanations are that the data quality is not particularly good (also possible). In any case, the research award metrics ultimately cannot be used for doing more than differentiating low-grant fields from high-grant fields.

In addition, smaller departments will have more variability in grant funding year-to-year than larger departments. When funding rates are low (10-20%), small departments may have $0 grant funding in one year and several awards come through in subsequent years, while large departments will have a more consistent funding level. While it is not clear how funding is counted on an annual basis (e.g. whether `research_awards_growth_inc_nuf_fy2020_total_research_awards` counts awards which started in 2020, were awarded in 2020, or incremental funding on multi-year awards that happened to be received by the university in 2020), if funding is counted at the award level and not the amount received per year, this measure gets to be even more "lumpy" and inconsistent from year to year. When taking a ratio of differences, as in `research_awards_growth_inc_nuf_percent_of_total`, this inconsistent behavior becomes even

more problematic. It would be far better to fit a trend line with 4 or even 10 years of per-capita funding data to each department, and then do inference based on the slope of that line, generating a confidence interval or even a z-score for the slope of the line. Note that we do *not* recommend comparing departments based on that z-score, because the amount of funding available will be conditional on the department discipline, and picking winners and losers within UNL based on federal grant funding availability is short-sighted. Metrics are useful for description even when they are not used for inference.

> ⚠️ **Warning 18: Problems with `research_awards_growth_inc_nuf_fy20_fy24`**
>
> Of all of the random variables created in this analysis, the most problematic from a statistical theory perspective might be `research_awards_growth_inc_nuf_fy20_fy24` (and its instructional companion, `instructional_sch_4Y_share_growth`). This is the ratio of two differences, where we might reasonably model each value in the numerator as a normal random variable with mean μ_d and standard deviation σ_d (d for department), and each value in the denominator as random variables with mean μ_u and standard deviation σ_u (u for university). The problem with this is that the two differences, $\mu_{d,2024} - \mu_{d,2020}$ and $\mu_{u,2024} - \mu_{u,2020}$ have mean zero, which leads to a $\frac{0}{0}$ situation that is mathematically undefined.
>
> In statistical terms, if the numerator and denominator have mean 0, then the random variable representing the ratio is **Cauchy** distributed. Cauchy distributions are heavy-tailed (values far away from the mean are much more likely than they would be with a normal distribution), that is, they generate extreme values more frequency. Cauchy distributions are difficult to work with because they do not have a (meaningful) mean or a standard deviation. It is possible to generate draws from a Cauchy distribution, and even to take the mean and standard deviation of those draws, but the values do not describe anything useful about the underlying data. The mean will never converge to a single value, even with a million or billion samples, unlike nearly every other common distribution.
>
> As a result, calculating the z-score for something that has or might be expected to have a Cauchy distribution is fundamentally problematic, because neither the mean or the standard deviation will have any real-world meaning or even be numerically stable. The Central Limit Theorem requires that variables have finite variance precisely because of the counterexample of the Cauchy distribution.
>
> Cauchy random variables are typically not covered in undergraduate math-stat and probability courses, except perhaps a mention in passing. That they arise so readily in this type of analysis is just another example why it is fundamentally necessary to have graduate statistical training or oversight in order to use complex functions of random variables to make practical decisions that will hold up under scrutiny.

1.74 `research_awards_growth_inc_nuf_fy2020_total_research_awards` Total sponsored research awards received in FY2020. Included are all sponsor types: federal, industry, state agencies, associa-

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[2]The Fulbright program might be one common exception, as it allows applications from many different disciplines. However, this would likely fall under "Awards" more generally instead of research awards/grants.

tions/nonprofits and the NU Foundation. This includes purpose code research only. Awards are credited to departments using NuRamp routing forms. For PI/co-PIs who routed their credit through a unit outside a department, efforts were made to credit a department using the individual's HR tenure org unit, primary org unit and any secondary appointments.

1.75 `research_awards_growth_inc_nuf_fy2024_total_research_awards` Total sponsored research awards received in FY2024. Included are all sponsor types: federal, industry, state agencies, associations/nonprofits and the NU Foundation. This includes purpose code research only. Awards are credited to departments using NuRamp routing forms. For PI/co-PIs who routed their credit through a unit outside a department, efforts were made to credit a department using the individual's HR tenure org unit, primary org unit and any secondary appointments.

1.76 `research_awards_growth_inc_nuf_fy20_fy24` `research_awards_growth_inc_nuf_fy2024_total_resear` minus `research_awards_growth_inc_nuf_fy2020_total_research_awards` Growth of sponsored research awards from FY20 to FY24. Included are all sponsor types: federal, industry, state agencies, associations/nonprofits and the NU Foundation. This was calculated by taking the dollar growth over the time period of FY24 – FY20 as a percentage of total growth for the institution resulting in that unit's share of the overall growth dollars for the institution over the reported time period.

1.77 `research_awards_growth_inc_nuf_percent_of_total` `research_awards_growth_inc_nuf_fy20_fy24` for the department/unit divided by `research_awards_growth_inc_nuf_fy20_fy24` for UNL as a whole

1.61 `research_awards_growth_inc_nuf_z_score` Z score of `research_awards_growth_inc_nuf_fy20_fy24`

C.2.6 Total Sponsored Awards Inc NUF RSCH PUB SERV TEACH

1.71 `average_total_sponsored_awards_inc_nuf_rsch_pub_serv_teach_fy2020_fy2024` Average annual sponsored awards received in FY20 to FY24. Included are all sponsor types: federal, industry, state agencies, associations/nonprofits and the NU Foundation. Purpose codes reported include research, teaching and public service which are summed and divided by total state appropriated budget. Awards are credited to departments using NuRamp routing forms. For PI/co-PIs who routed their credit through a unit outside a department, efforts were made to credit a department using the individual's HR tenure org unit, primary org unit and any secondary appointments.

1.73 `total_sponsored_awards_inc_nuf_rsch_pub_serv_teach_avg_awards_budget` `Average_total_sponsored` divided by `budget_from_evc_file_state_appropriated_budget` Average sponsored awards for FY20-24. Included are all sponsor types: federal, industry, state agencies, associations/nonprofits and the NU Foundation, for purpose codes research, teaching and public service divided by total state appropriated budget.

> ⚠ Warning 19: Problems with total_sponsored_awards_inc_nuf_rsch_pub_serv_teach_avg_awards_budge
>
> It's unclear why the `total_sponsored_awards_inc_nuf_rsch_pub_serv_teach_avg_awards_budget` indicator was divided by total state appropriated budget, but the numbers for Statistics grants are all over the place. For instance, if we multiply the 0.362 value for statistics (before it is converted to a z-score) by the state permanent budget from 2025-26, we get 4.8118524×10^5. One PI in the department brought in 1.2 million dollars in grant money during the 2020-2024 period. Thus, we have had a difficult time validating these numbers in any way.

1.60 `awards_budget_inc_nuf_z_score` Z score of `total_sponsored_awards_inc_nuf_rsch_pub_serv_teach_av`

C.2.7 P1 Expenditures

1.67 `p1_expenditures_2014_2023_avg` The average competitively funded federal research support as defined by the AAU membership policy, federal research expenditures less USDA research expenditures adding in awards from USDA Agriculture Food and Research Initiative (AFRI). Expenditures and AFRI awards are credited to departments using NuRamp routing forms. For PI/co-PIs who routed their credit through a unit outside a department, efforts were made to credit a department using the individual's HR tenure org unit, primary org unit and any secondary appointments. From the AAU Membership Policy: Competitively funded federal research support: federal R&D expenditures. A ten-year average of federal research expenditures (including S&E and non-S&E) adjusted to exclude USDA formula-allocated research expenditures. This indicator includes obligations for the AFRI program funded by USDA. National Science Foundation (NSF) Survey of Research and Development Expenditures at Universities and Colleges/Higher Education Research and Development Survey (HERD), data for the most recently available ten-year average. AFRI Obligations, data for the ten years that match the years from HERD.

1.78 `p1_expenditures_normalized` `p1_expenditures_2014_2023_avg` divided by `t_tt_headcount_2014_2023_a`

1.62 `p1_expenditures_normalized_z_score` Z score of `p1_expenditures_normalized` Normalized competitively funded federal research expenditures as defined by the AAU membership policy for the time period of FY2014 to FY2023. Data is normalized by the average T/TT faculty headcount over the same time period as reported to IPEDS.

C.3 Teaching

> ⚠️ Warning 20: Data Lockout and Validation
>
> It is hard to validate the teaching metrics, because the administration has directed the registrar's office and the graduate college "not to distribute data related to proposed budget reductions at this time" (email between Sarah Zuckerman and Debra Hope, Graduate College).
> The Statistics department had similar trouble getting data from Chad Brasil, though most of it could be assembled (sometimes manually) using published Tableau dashboards. As a result, it is much harder to comment on or validate the teaching metrics. There are likely similar problems with the way variables were assembled, but because of the administrative lockout, we cannot do the necessary detective work to identify those problems.

C.3.0.1 Enrollment

1.42 `U_major_n` Count of undergraduate majors, including non-primary majors. 1.44 `G_major_n` Count of graduate majors, including non-primary majors. 1.46 `P_major_n` Count of professional majors, including non-primary majors. 1.87 `majors` Sum of U, G, and P majors (all majors).

1.22 `major_completions_bachelor_degree` Count of all Bachelors completions within major (including non-primary majors).

1.24 `major_completions_two_years_college` Count of all graduate certificate completions within major (including non-primary majors).

1.26 `major_completions_masters_degree` Count of all Masters completions within major (including non-primary majors).

1.28 `major_completions_doctorate_degree` Count of all Doctorate completions within major (including non-primary majors).

1.30 `major_completions_post_masters` Count of all Post Masters completions within major (including non-primary majors).

1.43 `U_primary_major_n` Count of undergraduate primary majors.

1.45 `G_primary_major_n` Count of graduate primary majors.

1.47 `P_primary_major_n` Count of professional primary majors.

1.23 `degree_n_bachelor_degree` Count of all Bachelors degrees with attached major (primary)

1.25 `degree_n_two_years_college` Count of all graduate certificates with attached major (primary).

1.27 `degree_n_masters_degree` Count of all Masters degrees with attached major (primary).

1.29 `degree_n_doctorate_degree` Count of all Doctorate degrees with attached major (primary).

1.31 `degree_n_post_masters` Count of all Post Masters degrees with attached major (primary).

1.88 `degrees` Sum of Bachelors, Masters, Doctorate, and Post Masters primary degrees

---

1.89 `ratio_completions_majors` Ratio of all degree completions (all majors attached to a degree) to all majors, including non-primary.

> ⚠️ **Warning 21: Completions to Majors for New Programs**
>
> The statistics department has a new undergraduate program that, for AY 2024 (the last AY with statistics), had two cohorts of students. These students are included in the denominator as majors, but could not possibly have completed the program. As a result, of course, the department looks like we have a large dropout rate or are otherwise performing poorly.
> It would be more reasonable to exclude new majors from this count until the program is mature and has all cohorts filled. In prior years, the statistics department has hovered around a 25% - 28% completion ratio, which reflects that our MS students take approximately 2 years to finish and our Ph.D. students take between 4 and 6 years to finish. We fully expect that our ratio will return to about that level when our undergraduate program is mature (if, of course, the university decides to keep this program), but it will likely decrease until that point, because we continued adding students who will take 4 years to graduate in AY 2025, and our first cohort is not expected to graduate until 2026.

1.871 `minors_U` Count of all undergraduate students in one or more minors offered by the unit.

1.872 `minors_G` Count of all graduate students in one or more minors offered by the unit.

1.86 `enrollment` Sum of U, G, and P unduplicated AY headcount

1.94 `average_enrollment` Mean of unduplicated enrollment headcount by unit.

1.93 `all_majors_share_growth` Change in share (percentage) of total (duplicated) majors from AY2020 to AY2024.

1.53 `retention_rate` First-year to second-year retention rate (cohort = AY - 1).

1.54 `avg_retention_rate` Average of first-year to second-year retention rates of last 5 cohorts. Note that average retention rates for units with average starting cohorts less than 5 were nullified.

1.55 `grad_rate6` Six-year graduation rate (cohort = AY - 5). Graduation rate includes students that graduated from UNL.

1.56 `avg_grad6` Average of six-year graduation rates of last 5 cohorts. Note that average graduation rates for units with average starting cohorts less than 5 were nullified.

> ⚠ Warning 22: Graduation Rates Shouldn't Be Pooled
>
> Most undergraduate programs take 4 years to complete. Most MS programs take 1-2 years to complete. Ph.D. programs vary considerably, but post-MS work might take between 2 to 4 years to complete, assuming the MS work transfers.
> It is utterly confusing, then, to compute six-year graduation rates when the expected time to degree completion is so widely variable – six years is enough time for 5 different MS cohorts to complete their degrees, but only 2-3 undergraduate and Ph.D. cohorts! It's also not uncommon for statistics students to get an MS and a PhD within 6 years - are those students counted twice?
> Ultimately, graduation rates should be computed separately for each program, and if those are then averaged somehow that would be at least potentially sensible. But it is important to consider expected time to degree when computing graduation rates.

C.3.1 SCH & Tuition

1.48 `sch` Sum of course SCH by owner of course subject code.

> ⚠️ **Warning 23: 2020 anomalies**
>
> The SCH reported for AY 2020 are almost universally off by a factor of around 10. This anomaly needs to be tracked down and investigated, because while it may not affect any department differently, it puts the provenance of the data and the quality control measures in question. Systematic errors are a red flag to go back and consider whether the data quality is sufficiently high to be making decisions based on this data.

1.49 `total_realizable_base_tuition` sch by course career and student residency times base tuition rate. For AY2024, these rates were: Career | Resident | Non-resident — | — | — UG | $268 | $859 G/P | $353 | $1031

1.52 `instructor_sch` The logic for Instructional SCH is:

- If a course prefix maps to a "unit" that is instructed by a faculty member with an appointment in that "unit" then the SCH will be assigned to that "unit".
- If a course prefix maps to a "unit" that is instructed by a faculty member WITHOUT an appointment in that "unit" then the SCH will be assigned to the "unit" where the faculty member has their largest percentage of appointment (primary appointment home).
- If a course maps to a "unit" that is instructed by a faculty member without an appointment e.g., no instructor of record recorded, then the SCH is assigned to the "unit" according to the course prefix.

1.84 `instructional_sch` Sum of SCH attributed to instructors' home departments. The formula takes the percentages designated to each instructor in Peoplesoft. `Sum(Section SCH x Instructor %)`

Because this is very involved, the following example is provided. Suppose we are tracking the SCH/faculty/class meetings for the following two faculty members:

Fac Member	Unit	FTE
Albert Einstein	Physics	1.00
Marie Curie	Chemistry	0.51
Marie Curie	Physics	0.49

Albert Einstein has a 1.0 FTE appointment in Physics, whereas Marie Curie has a primary appointment in Chemistry (0.51 FTE) and secondary appointment in Physics (0.49 FTE).

Here are five courses from the course catalog:

No	Catalog Listing	Description	Owner	Faculty	Instr Pct	SCH
1	CHEM300 SEC01	Fun with Radium	Chemistry	Curie	1.0	100
2	PHYS201 SEC01	Light Speed I	Physics	Einstein	1.0	100
3	PHYS201 SEC02	Light Speed I	Physics	Curie	1.0	100
4	CHEM301 SEC01	Radium at Light Speed	Chemistry	Curie	0.5	100
4	CHEM301 SEC01	Radium at Light Speed	Physics	Einstein	0.5	100
5	CHEM400 SEC01	Chemical Makeup from Quite Far Away	Chemistry	Curie	1.0	125
5	PHYS400 SEC01	Chemical Makeup from Quite Far Away	Physics	Einstein	1.0	98

Course 1 is offered by Chemistry and instructed by Marie Curie, who has an appointment in Chemistry, so CHEM gets all 100 SCH (100 x 1.0). Similarly, SCH from courses 2 and 3 go to the course owner because the faculty have an appointment in that unit.

Course 4 is a Chemistry course team taught by Curie and Einstein. The 50 SCH (100 x 0.5) for Curie go to Chemistry based on the appointment logic. The 50 SCH for Einstein go to Physics (100 x 0.5) because he doesn't have an appointment in Chemistry.

Course 5 is cross-listed. 125 SCH (125 x 1.0) go to Chemistry since Curie has a CHEM appointment. 98 SCH (98 x 1.0) go to Physics based on the same logic.

1.90 `instructional_sch_to_instructional_fte` Instructional SCH divided by apportioned teaching FTE

1.91 `average_instructional_sch` Mean of instructional SCH by unit.

1.92 `instructional_sch_4Y_share_growth` Change in share (percentage) of total instructional SCH from

128

AY2020 to AY2024.

> ⚠️ **Warning 24: Problem: `instructional_sch_4Y_share_growth`**
>
> This is another variable which is likely Cauchy distributed (see Warning 18), that is, it is the statistical equivalent of dividing by zero - the mean of the numerator is likely to be zero (in distribution) and the mean of the denominator is likely to be zero (in distribution) – each year's SCH would be expected to be sampled from the same distribution at the department and university level.
> The problem is that these variables do not have a distribution mean and have infinite variance. It is obviously possible to take the average of observations from this distribution, but the average will never converge (unlike samples from almost any other distribution - the average of an increasing number of samples will converge to the distribution mean, but only if the distribution has finite variance).
> Taking a variable like this, and then calculating the mean and standard deviation across departments to standardize these variables makes this even more problematic, because it removes any meaningful information in the variable. Then, averaging these z-scores as part of an omnibus instructional z-score only serves to erase any meaningful information in the instructional z-score.
> These problems exist in both the instructional and research z-scores, which renders the entire metric analysis statistically uninformative. Cauchy random variables are the bane of every statistics graduate student's existence - they are primarily useful for counterexamples in proofs, but when they pop up in practice, they are always a pain to deal with, and if you don't handle them correctly, they will ruin everything.
> Unfortunately, the UNL administration will learn this the hard way, either by acknowledging the issue and reworking the budget reduction plan, or by eliminating highly ranked and high-performing departments because of a badly-executed statistical analysis.

C.3.2 Ratios

> ⚠️ **Warning 25: Ratios are Stochastic Nightmares**
>
> The variability of calculated ratios complicates statistical analysis.
> If a ratio is taken of variables with mean zero, the resulting random variable does not have a mean, standard deviation, or any other "statistical moments" (these variables have a Cauchy distribution, which does not have a mean). This does not mean that you can't take the average of Cauchy distributed random variables – it only means that that number does not have any real-world meaning. Even when the variables don't have zero mean, taking ratios of numbers like this that have some stochastic noise can be problematic, as variability in the denominator has an outsized effect on the overall value.

1.85 `budget_to_sch` total original state aided budget divided by SCH

1.16 `instructional_sch_to_instructional_fte` Sum of each instructor's section instruction percentage times section sch by home department of appointment divided by `total_instructor_fte`.

C.4 Instructional Z-scores in Institutional Metrics

All z-scores (also known as standardized or normalized scores) were calculated as the difference of the actual metric and the mean of the metric for included units divided by the standard deviation of the included units' metrics.

It measures the number of standard deviations a metric is from the mean. In a normal distribution, approximately two-thirds of scores fall within +/- 1 standard deviation of the mean. Approximately 95% of cases fall within +/- 1.96 standard deviations of the mean. Traditionally – but not universally – cases beyond the 1.96 standard deviation threshold are considered outliers.

⚠ Warning 26: Instructional Z-score Problem

While standardizing scores is common practice in some circumstances, it is problematic as used here, in part because it assumes that there is a single common distribution used for these values. For instance, disciplines that only have graduate programs cannot be assumed to have the same distribution of SCH because of much lower numbers of graduate students. It is utterly ridiculous to compare these programs to programs such as math or english who teach large numbers of nonmajor undergraduate service courses and will have SCH values on a vastly different scale. Departments **do not** have quantities which can be said to be "identically distributed" (in statistical parlance) even if you assume that the instructional metrics are reflective of a distribution of department performance, because not every department is competing in every pool. At minimum, it would be necessary to do some assessment of whether a course is primarily taken by majors or nonmajors, and then compare service teaching load separately from major teaching load, and undergraduate hours separately from graduate hours. Even under this system, it is probably necessary to "bin" departments based on the number of service courses taught/required on an annual basis, because e.g. Math will teach Calc 1, 2, 3, but Chemistry might teach an elective introductory course that counts for a science prerequisite, and the structural differences between these two departments and their relationship to other majors offered on campus matter significantly. While these factors are related to department productivity, no amount of work by the EDAD department is going to ensure that they teach every undergraduate STEM major an introductory service course, and as such it is ridiculous to compare SCH between EDAD and MATH or PHYS or STAT.

Moreover, the description of interpretation implies that these are normally distributed variables, but e.g. share of growth is necessarily confined to a value between 0 and 1, which is decidedly not normal because the normal distribution has support over the entire real line (that is, every value between $-\infty$ and ∞ has a positive, theoretically non-zero probability, though of course the values far from

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the mean of the distribution are expected to be infinitesimal).

When a metric consists of a ratio of two values, as many of these metrics do, it is even less likely that the random quantity has a normal distribution. In fact, if the numerator and denominator both have mean zero, the ratio is Cauchy distributed, and Cauchy variables do not have estimable means or variance – you can calculate a value for observed data, but it does not mean anything or converge to anything and is not an estimator of any useful quantity. While the problem is not quite as dramatic when the means of both distributions are nonzero, it is still important to be cautious because there are a number of different ratio distributions which might be relevant and not all of them are "nice". This might be expected to be the case with a variable like `budget_to_sch_2024`, and it is almost certainly also true of `instructional_sch_4Y_share_growth`

Ultimately, just because you *can* calculate a z-value doesn't ensure that it has meaning in the context of the data. Even if it would *seem* to have meaning, and every point is taken from the same reference distribution, if the values are ratios, it would probably be good to check with a statistician before proceeding, because it is *very* easy to end up in a nonsensical mathematical situation.

2.10 `instructional_average` Mean of instructional z-scores.

2.11 `research_average` (Research Average z-score) Mean of research z-scores

2.12 `overall_average` Mean of instructional and research average z-scores.

2.1 `zinstructional_sch_4Y_share_growth` Standardized `instructional_sch_4Y_share_growth`

2.2 `zall_majors_share_growth` Standardized `all_majors_share_growth`

2.3 `zinstructional_sch_2024` Standardized `instructional_sch_2024`

2.4 `ztotal_majors_n_2024` Standardized `total_majors_n_2024`

2.5 `zinstructional_sch_to_instructional_fte_2024` Standardized `instructional_sch_to_instructional_f`

2.6 `zbudget_to_sch_2024` Standardized `budget_to_sch_2024`

2.7 `znet_realizable_tuition_less_budget_2024` Standardized `net_realizable_tuition_less_budget_2024`

2.8 `zavg_retention_rate_2024` Standardized `avg_retention_rate_2024`

2.9 `zratio_completions_majors_2024` Standardized completions (all majors) to majors.

2.14 `instruction_weight` `percent_teaching / (percent_teaching + percent_research)`. This is set to zero when the denominator is zero.

2.15 `research_weight` `percent_research / (percent_teaching + percent_research)`. This is set to zero when the denominator is zero.

2.13 `weighted_overall_average` Mean of `instructional_average` and research average weighted by `instruction_weight` and `research_weight` respectively.

2.16 `mad_instructional_sch_4Y_share_growth` Standardized `instructional_sch_4Y_share_growth` using median and median absolute deviation (MAD). MAD was scaled using `sd(x) / mad(x, const = 1)` method.

2.17 `mad_all_majors_share_growth` Standardized `all_majors_share_growth` using median and median absolute deviation (MAD). MAD was scaled using `sd(x) / mad(x, const = 1)` method.

2.18 `mad_instructional_sch_2024` Standardized `instructional_sch_2024` using median and median absolute deviation (MAD). MAD was scaled using `sd(x) / mad(x, const = 1)` method.

2.19 `mad_total_majors_n_2024` Standardized `total_majors_n_2024` using median and median absolute deviation (MAD). MAD was scaled using `sd(x) / mad(x, const = 1)` method.

2.20 `mad_instructional_sch_to_instructional_fte_2024` Standardized `instructional_sch_to_instruction` using median and median absolute deviation (MAD). MAD was scaled using `sd(x) / mad(x, const = 1)` method.

2.21 `mad_budget_to_sch_2024` Standardized `budget_to_sch_2024` using median and median absolute deviation (MAD). MAD was scaled using `sd(x) / mad(x, const = 1)` method.

2.22 `mad_net_realizable_tuition_less_budget_2024` Standardized `net_realizable_tuition_less_budget_2` using median and median absolute deviation (MAD). MAD was scaled using `sd(x) / mad(x, const = 1)` method.

2.23 `mad_avg_retention_rate_2024` Standardized `avg_retention_rate_2024` using median and median absolute deviation (MAD). MAD was scaled using `sd(x) / mad(x, const = 1)` method.

2.24 `mad_ratio_completions_majors_2024` Standardized completions (all majors) to majors using median and median absolute deviation (MAD). MAD was scaled using `sd(x) / mad(x, const = 1)` method.

2.25 `pool_znstructional_sch_4Y_share_growth` Standardized `instructional_sch_4Y_share_growth` within discipline pool.

2.26 `pool_zall_majors_share_growth` Standardized `all_majors_share_growth` within discipline pool.

2.27 `pool_zinstructional_sch_2024` Standardized `instructional_sch_2024` within discipline pool.

2.28 `pool_ztotal_majors_n_2024` Standardized `total_majors_n_2024` within discipline pool.

2.29 `pool_zinstructional_sch_to_instructional_fte_2024` Standardized `instructional_sch_to_instructi` within discipline pool.

2.30 `pool_zbudget_to_sch_2024` Standardized `budget_to_sch_2024` within discipline pool.

2.31 `pool_znet_realizable_tuition_less_budget_2024` Standardized `net_realizable_tuition_less_budget` within discipline pool.

2.32 `pool_zavg_retention_rate_2024` Standardized `avg_retention_rate_2024` within discipline pool.

2.9 `pool_zratio_completions_majors_2024` Standardized completions (all majors) to majors within discipline pool.

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The report has moved