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Housing & Residence Life Impact Report: Fall 2017 to Spring 2018

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Housing & Residence Life

IMPACT ANALYSIS

FALL 2017 - SPRING 2018

Powered by Academic and Instructional Services

Report Presented May 2019

On-Campus Housing & Residence Life Influences Student Persistence to the Next Term

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Students who lived on campus experienced an increase in persistence to the next term compared to similar students who did not live on campus (DID = 0.01, p < 0.01).

INTRODUCTION: Living on campus is considered a high impact practice for student success. Student success is believed to emerge from "the amount of physical and psychological energy that the student devotes to the academic experience" (Astin, 1984), housing and residence life programming facilitates this type of devotion. However, creating this type of living experience requires administrators understand the complexities of how housing can affect specific student groups and their decision to either persist at or leave an institution.

This report explores the impact of housing and residence life at Utah State University on students living on campus. It disaggregates results to identify which segments of students benefit most and it explores the impact by living community and dormitory style.

METHODS: Students who lived on campus were compared to similar students who did not live on campus. They were compared using prediction-based propensity score matching. This technique matched students who lived on campus with non-users based on their persistence prediction and their propensity to participate. The difference between predicted and actual persistence rates were compared using difference-in-difference testing.

FINDINGS: Students were 98% similar following matching. Those who lived on campus were significantly more likely to persist at USU than similar students who did not live on campus, (DID = 0.0119, p < .001). The unstandardized effect size can be estimated through student impact. It is estimated that housing assisted in retaining 46 (CI: 21 – 71) students each year who were otherwise not expected to persist.

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Does living on campus influence student persistence to the next term?

WHY PERSISTENCE?

Student success can be defined in various ways. One valuable way to view student success is through progress towards graduation. Progress towards graduation reflects students acquiring the necessary knowledge and accumulating credentials that prepare them for graduation. Progress towards graduation can be measured through student persistence. Here, persistence is defined as term-to-term enrolment at Utah State University. As a measurement, persistence facilitates a quick feedback loop to identify what's working well and what can be better (Baer, Hagman, & Kil, 2020).

WHY USE ANALYTICS?

Higher education professionals labor to support student success in all its various forms, not just through persistence. However, professionals now have access to far more data than they can feasibly interpret and utilize to support student success without the help of analytics. Fortunately, USU has access to professional tools that can process and organize data into insights that have historically been hidden from view (Appendix A). University professions can leverage insights to directly influence student success (Baer, Kil, & Hagman, 2019). Indeed, analytics aligns with USU's mission to be a "premier student-centered land-grant institution" by allowing professionals to know what is going well and what could be better (see Appendix G for the evaluation cycle).

HOUSING & RESIDENCE LIFE ASSOCIATION WITH STUDENT PERSISTENCE

Students' place of residence has long thought to be the "most important and pervasive" environmental factor in predicting their likelihood to persist to the next semester (Astin, 1984). The goal of Housing & Residence Life is to support student persistence by acting as a resource for social and academic growth.

The impact of Housing & Residence Life on student persistence was measured in this report. Students with a housing contract during the semester were compared to similar students who did not have a housing contract. The results from this analysis support the theory that Housing and Residence Life is an important contributor to student persistence.

The Relationship Between Housing & Residence Life and Persistence

Housing & Residence Life is designed to enhance the college experience by providing students with unbeatable housing locations and experiences. Utah State University has eight difference residential communities that were assessed in this analysis:

- Aggie Village
- Blue Square
- Central Suites
- Darwin
- Living Learning Community
- Richards & Bullen Halls
- SLC
- South
- The Towers

Across these different living communities there are also different residence styles: traditional dorms, apartments, and suites. All of the communities are intended to support the framework of Housing & Residence Life by supporting student integration into the Aggie family. Students benefit from trained and accessible staff members, coordinated activities, and bundled amenities.

It was expected that the services provided by Housing & Residence Life would positively influence student persistence to the next term, along with other student wellness outcomes not specifically addressed in this report.

Impact Analysis Results

STUDENT IMPACT

Students who lived on campus experienced a significant increase in persistence to the next term. The estimated increase in persistence is equivalent to retaining 46 (CI: 21 – 71) students each year who were otherwise not expected to persist. This represents an estimated $218,664.22 ($99,824.97 - $337,503.47) in retained tuition per year, assuming an adjusted tuition of $4,753.57 (see Appendix C for estimated tuition table).

PARTICIPANT DEMOGRAPHICS

Matching procedures for this analysis resulted in the inclusion of 63.8% of available participants. Students were 50.22% male, 86.15% Euro-American, 70.0% first-time college students, and 92.9% undergraduate.

Prior to matching, participating and comparison students were 79% similar based on propensity to live on campus and 51% similar based on predicted persistence. Following matching, the participating and comparison students were 98% similar for both (see Appendix E for more details).

SUMMARY STATISTICS

Overall Change in Persistence:.. 1.19% (0.55% to 1.83%)
Overall Change in Students (per term):..46 (21 to 71) Students
Analysis Terms: ....Spring 2015 to Fall 2018
Students Available for Analysis:.. 24,655 Students
Percent of Students Participating:.. 17.7%
Students Matched for Analysis: .... 15,730 Students
Percent of Students Matched for Analysis 63.8%
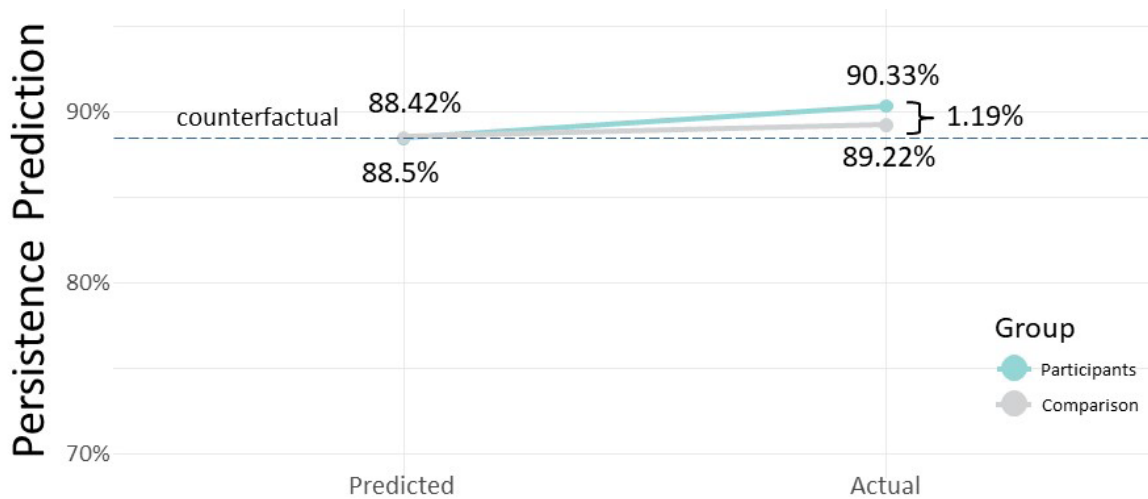
FIGURE 1

Participant and comparison students begin with highly similar persistence predictions. Actual persistence is significantly different between groups.

CHANGE IN PERSISTENCE

Change in persistence is measured using a difference-in-difference statistic that compares difference between the predicted persistence and actual persistence between participating and comparison students. Comparisons are made between matched pairs, which are optimized through prediction-based propensity score matching (see Appendix B for details).

After matching, students who lived on campus and students who did not were 98% similar in their persistence prediction and 98% similar in their propensity to persist (Appendix E). On average, both participating students and comparison students were predicted to be 88.46% likely to persist to the next semester. Actual persistence was significantly different between participant and comparison students: 90.33% for participants and 89.22% for comparison students.

IMPACT BY TERM

The exploration of term level data can provide insights into programmatic changes across time. Analysis found that the impact of living on campus varied by term. Fall 2017 and Fall 2018 experienced a significant increase in

persistence. Most terms show a positive trend with the exception of Spring 2016, where there is a negative, non-significant trend for students living on campus.
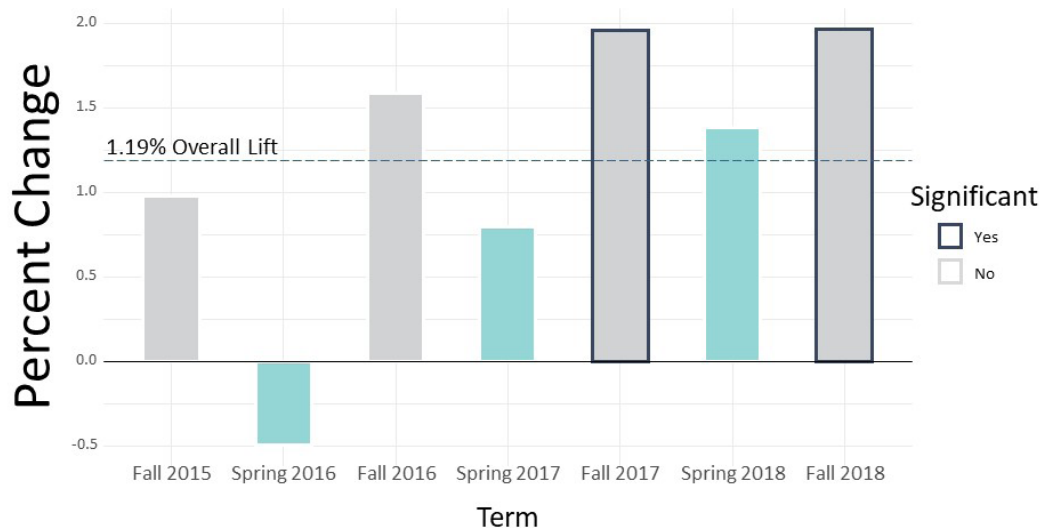
FIGURE 2

Change in persistence by term. Terms in which students experienced a significant impact from Housing & Residence Life are outlined in black.
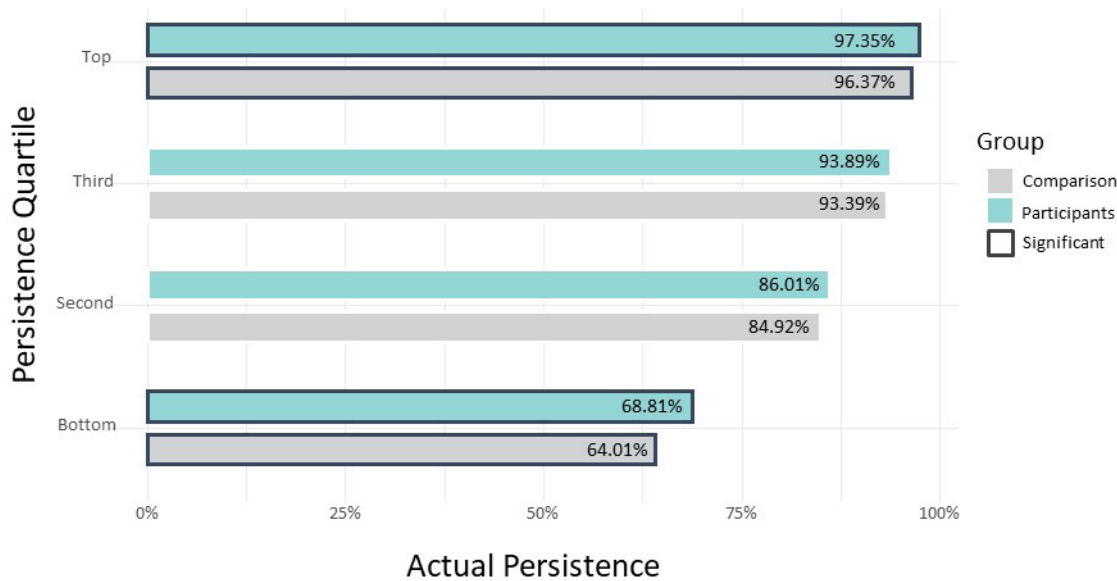
Impact by Persistence Quartile

STUDENT PERSISTENCE

Illume Impact utilizes historical data to predict student persistence to the next term. This analysis categorizes each student as part of either the bottom, third, second, or top persistence quartiles, depending on the student's predicted likelihood to persist. Students in the bottom quartile are predicted to be least likely to persist, while students in the top quartile are most likely to persist.

Students in the bottom and top persistence quartiles experience a significant increase in persistence from living on campus. The increase in persistence is especially large for students in the bottom persistence quartile (the students most likely to leave USU). The 4.78% increase in persistence reflects an estimated retention of 15 (4 to 26) students each year.

Students in the top persistence quartile also experienced a significant increase in persistence to the next term. This group is considered the most likely to persist at USU. It is difficult to have an impact on students in the top predicted persistence quartile, given their high likelihood to persist there is less elasticity to make positive change. Even so, living on campus significantly influenced persistence for students in the top quartile. This increase is associated with retaining 9 (1 to 17) students.

Impacted Student Segments

Illume Impact provides an analysis that looks at various student segments to identify how the program influenced students with specific characteristics. Please note that the student segments are not mutually exclusive. Table 1 shows all student segments who experienced a significant change from living on campus. Appendix D lists all student segments with non-significant findings.

Impact by Gender: Both students who identify as male and female experienced a significant increase in persistence from Housing & Residence Life. The increase in persistence is slightly higher for students who identified as female than for students who identified as male, 1.46% and 0.94% respectively.

Impact by Ethnicity and Race: USU has a high population of White or Caucasian and non-Hispanic or Latino students. For this reason, Impact analyses can often detect change in persistence for these groups; however, students of other races or ethnicities rarely reach the critical mass necessary to detect a significant change. With this in mind, the analysis found a significant increase in persistence for Caucasian and non-Hispanic students.

Interestingly, Hispanic students also experience a significant increase in persistence from living on campus. This lift is associated with retaining 4 (1 to 7) Hispanic students each year who were otherwise not expected to persist. The number of Hispanic students varies by term, with fewer students living on campus in more recent years. In 2015/2016 there were approximately 113 students who identified as Hispanic, and in 2017/2018 and 2018/2019 there was an average of 30 Hispanic students. Thus, this difference should be viewed in light of a changing sample size.

Student Segment Impact

TABLE 1:

Student segments experiencing changes from living on campus

N	Student Group**	Actual Persistence		Difference-in Difference	CI	Lift in People
		Participant Persistence	Comparison Persistence			
15,730	Overall	90.33%	89.22%	1.19%	0.64%	47
15,244	Not Hispanic or Latino	90.22%	89.27%	1.11%	0.65	42
14,613	Undergraduate Students	89.95%	88.89%	1.14%	0.67%	42
13,821	Full-time Courses	91.58%	90.74%	1.03%	0.64%	36
13,551	White or Caucasian	90.32%	89.24%	1.26%	0.68%	43
11,787	All On-Ground Status	90.17%	89.12%	1.14%	0.74%	34
11,005	First Time in College	89.49%	88.64%	0.99%	0.78%	27
10,121	Non-STEM Major	89.42%	88.40%	1.33%	0.81%	34
7,900	Male Students	90.33%	89.02%	0.94%	0.90%	19
7,830	Female Students	90.32%	89.43%	1.46%	0.90%	29
6,762	1-3 Terms Completed	87.56%	86.48%	1.21%	1.08%	21
4,535	4+ Terms Completed	94.54%	93.24%	1.26%	0.94%	14
4,432	0 Terms Completed	90.24%	88.74%	1.32%	1.23%	15
4,114	Top Persistence Prediction Quartile (75th - 100th Percentiles)	97.35%	96.37%	0.94%	0.75%	10
3,876	Mixed or Blended Status	91.09%	89.85%	1.33%	1.25%	13
1,324	Bottom Persistence Prediction Quartile (1st - 24th Percentiles)	68.81%	64.01%	4.78%	3.51%	16
1,116	Graduate Students	95.29%	93.60%	1.85%	1.81%	5
485	Hispanic or Latino	93.83%	87.58%	3.82%	3.75%	5

* Subgroups with fewer than 250 matched student pairs are considered too small for reliable analysis

** Student group definitions available in Appendix F
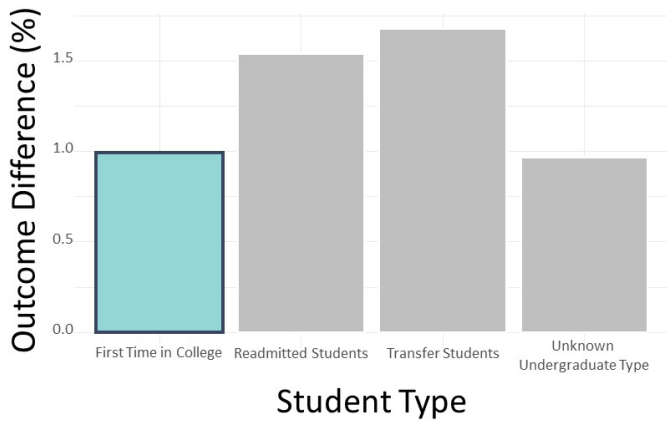
FIGURE 4
Change in persistence by student type.
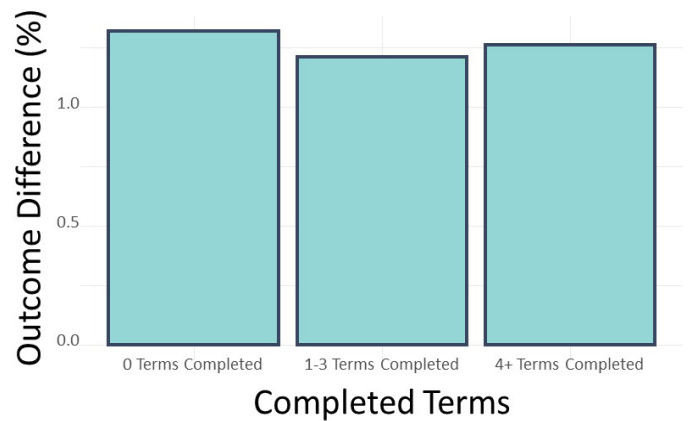
FIGURE 5
Change in persistence by number of terms completed.
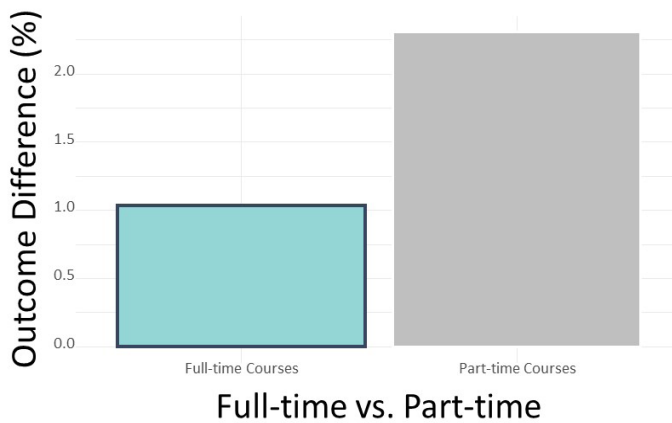
FIGURE 6
Change in persistence by time status.
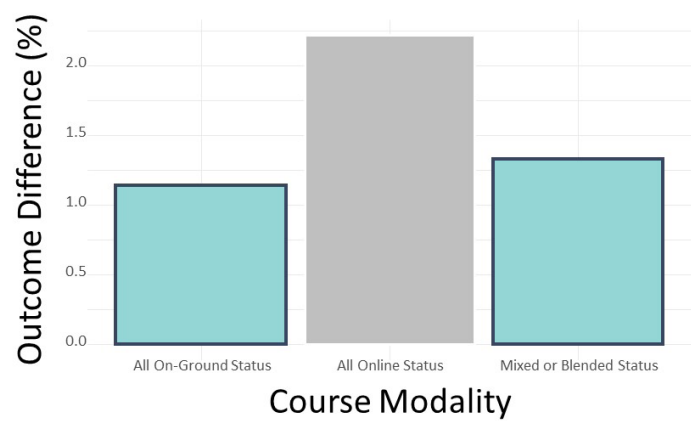
FIGURE 7
Change in persistence by course modality.

☐ SIGNIFICANT STUDENT SEGMENT

Impacted Student Segments [Continued]

Impact by student type (Figure 4): Housing & Residence Life influenced student persistence for first-time college students. Readmitted and transfer students did not experience a significant change in persistence from living on campus.

Impact by number of terms completed (Figure 5): Students at all points in the university experience experienced an increase in persistence from living on campus. New freshmen (0 terms completed), early career students (1-3 terms completed), and late career students (4+ terms) are all more likely to persist to the next semester compared to peers who do not live on campus.

Impact by time status (Figure 6): Full-time students experienced a significant increase in persistence, but not part-time students.

Impact by course modality (Figure 7): Students with all on-ground and mixed modality courses experienced a significant increase in persistence. Students taking all online classes did not experience an increase. However, there were only 66 students living on campus who were also online students over all terms considered in the analysis; this is too few students to make a confident estimation about the influence of Housing & Residence Life for online students.

FIGURE 8
Change in persistence by student living community. Students living in communities outlined in black experienced a significant increase in persistence.

Additional Analyses

INVESTIGATING THE IMPACT OF LIVING COMMUNITY

Housing & Residence Life has many communities across campus. Students living in each community, while still under the same umbrella of Housing & Residence Life, may have different experiences associated with on-campus living. Figure 8 illustrates that the gains in persistences are not evenly distributed across Housing & Residence Life communities. The results of these individual analyses can be unfolded upon request. Note, for this analysis Richards & Bullen halls were included in the Central living community.

INVESTIGATING THE IMPACT BY DORM TYPE

There are three dorm styles across campus: traditional, apartments, and suites. Each of the dorm types were associated with a significant increase in persistence to the next term.

Student Living Community

TABLE 2:
The change in persistence towards graduation for students by on-campus living community.

Community	Sample Size	Change in Persistence	CI	p-value	Change in students/ year
Any	15,730	1.19%	0.64%	0.0002	46
Blue Square	1,080	2.36%	2.46%	0.0605	NA
Central	2,381	0.62%	1.74%	0.4821	NA
Darwin	328	0.88%	4.37%	0.6915	NA
Family	3,354	1.19%	1.16%	0.0449	10
Living Learning Community	2,812	2.01%	1.52%	0.0096	14
SLC	4,087	1.88%	1.28%	0.0041	19
South	2,453	-0.62%	1.51%	0.4213	NA
Towers	3,168	1.03%	1.62%	0.2121	NA

Do students who have a meal plan experience an increase in persistence?

MEAL PLANS & STUDENT PERSISTENCE

At first glance, meal plans may seem to merely offer students food. But, food does more than fill an empty belly. Meal plans provide means for acquiring food resources to students who may be unable to access stores or cooking facilities. Meal plans also provide access to nutritional food for students who make lack the time or capacity for healthy meal preparation. Meal plans create opportunity for socialization, helping students build social networks on campus. Food promotes academic performance and student well-being (Maroto, 2013).

Given that meal plans are designed to support student success and well-being, this report explores the association between having a meal plan and student persistence. Several samples of students who live on campus were considered in this analysis.

First, the report explores students living on-campus with a meal plan compared to students who do not live on campus. This comparison is extended to look at those with a daily meal plan options and those who have a weekly meal plan option. Another analysis considered students living on campus in apartment style dormitories. Apartment residents with a meal plan were compared to apartment residents without a meal plan.

Only the analysis with students who had daily meal plans showed significant gains in persistence. All other analyses were non-significant.

The Relationship Between Meal Plans and Persistence

Within the framework of Housing & Residence Life, students enjoy access to Dining Services, a program dedicated to providing easy access to diverse and healthy meal plans. Students living both on- and off-campus can choose between several meal plans that vary in number of uses per week and/or semester.

Some residential living arrangements necessitate meal plans as some dorm styles do not have free access to a kitchen. Regardless of access to a kitchen, however, the convenience of having a meal plan could benefit students in any dorm living arrangement. This report considers several analyses that help us understand the impact of having a meal plan on student persistence to the next semester.

There is a group of students that have meal plans, but don't live on campus. Unfortunately, we were unable to isolate these students. It is possible that these were included in the analysis as comparison students. In the future, enhanced data collection should seek to capture this information to improve the comparisons made in this analysis.

Impact Analysis Results

STUDENT IMPACT

Students who lived on campus and had a meal plan did not experience a significant change in persistence to the next term compared to similar students who did not have a meal plan. This change, however, approaches significance (p-value = 0.05, CI=1.00%). The near significant results suggest that meal plans may have helped retain 18 (CI: 0 to 35) students per year who were otherwise not expected to persist. This represents an estimated $85,864.26 (CI: $0 to $166,374.95) in retained tuition per year, assuming an adjusted tuition of $4,753.57 (see Appendix C for estimated tuition table).

PARTICIPANT DEMOGRAPHICS

Matching procedures for this analysis resulted in the inclusion of 73.0% of available participants. Students were 47.6% male, 86.46% Euro-American, 86.5% first-time college students, and 98.5% undergraduate.

Prior to matching, participating and comparison students were 34% similar based on propensity to have a meal plan and 72% similar based on predicted persistence. Following matching, the participating and comparison students were 97% similar for both.

SUMMARY STATISTICS

Overall Change in Persistence:..1.00% (–0.01% to 2.01%)
Overall Change in Students (per term):.. NA
Analysis Terms: .... Fall 2015 to Fall 2018
Students Available for Analysis:..9,756 Students
Percent of Students Participating:...7.74%
Students Matched for Analysis: ....7,122 Students
Percent of Students Matched for Analysis 73.00%
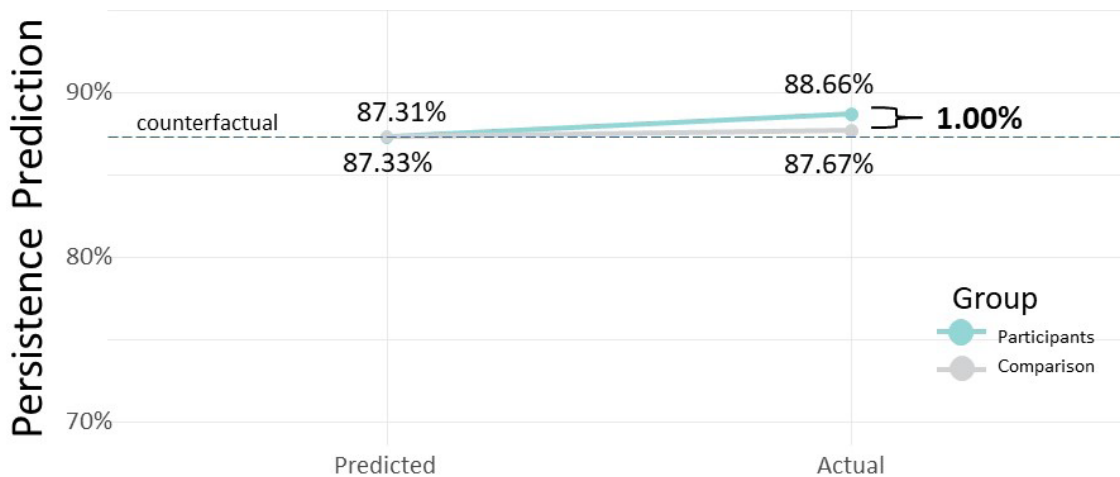
FIGURE 9

Participant and comparison students begin with highly similar persistence predictions. Actual persistence is significantly different between groups.

CHANGE IN PERSISTENCE

Change in persistence was measured using a difference-in-difference statistic that compares difference between the predicted persistence and actual persistence between participating and comparison students. Comparisons are made between matched pairs, which are optimized through prediction-based propensity score matching (see Appendix B for details).

After matching, students who lived on campus and students who did not, the groups were 97% similar in their persistence prediction and 97% similar in their propensity to persist (Appendix E). On average,

both participating students and comparison students were predicted to be 87.32% likely to persist to the next semester. Actual persistence was significantly different between participant and comparison students: 88.66% for participants and 87.67% for comparison students.

IMPACT BY TERM

The impact of living on campus and having a meal plan varied by term. Only Fall 2018 experienced a significant increase in persistence. With the exception of Spring 2016, semesters show a non-significant trend toward increasing persistence.
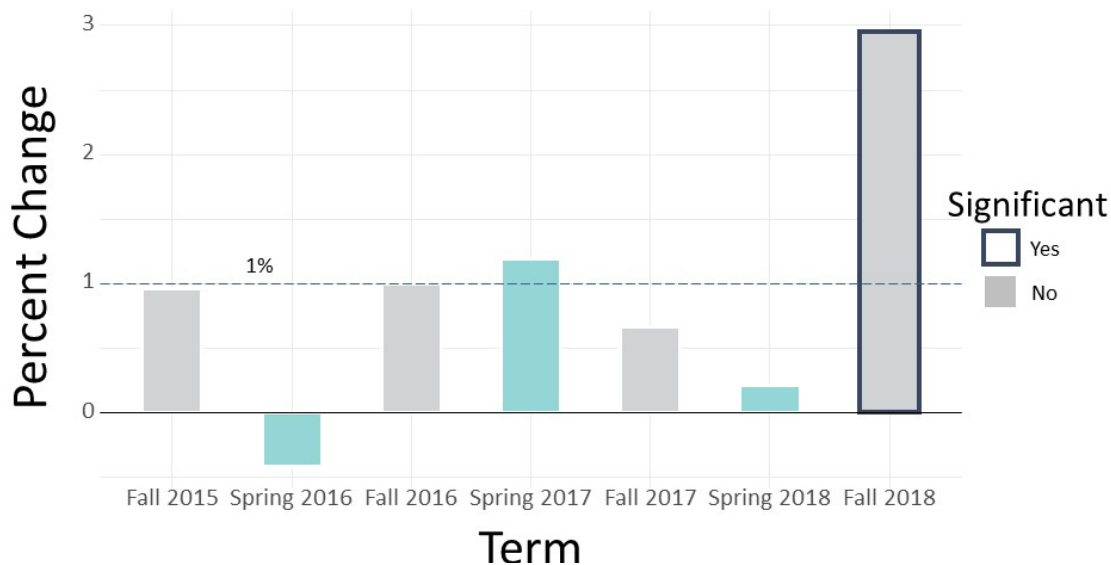
FIGURE 10

Change in persistence by term. Terms in which students experienced a significant impact are outlined in black.

Student Segment Impact

Student segments experiencing a significant change from having a meal plan

N	Student Group**	Actual Persistence		Difference-in Difference	CI	Lift in People
		Participant Persistence	Comparison Persistence			
7,019	Undergraduate Students	88.63%	87.61%	1.04%	1.02%	18
6,951	Not Hispanic or Latino	88.61%	87.68%	1.03%	1.02%	18
6,158	White or Caucasian	88.91%	87.77%	1.20%	1.07%	18
6,036	First Time in College	88.95%	87.65%	1.23%	1.09%	18
3,731	Female Students	89.37%	88.29%	1.40%	1.36%	13

** Student group definitions available in Appendix F

Impacted Student Segments

IMPACTED SEGMENTS

Illume Impact provides an analysis that looks at various student segments to identify how the program influenced students with specific characteristics. Please note that the student segments were not mutually exclusive. Table 1 shows all student segments who experienced a significant change from having a meal plan. Appendix D lists all student segments with non-significant findings.

In general, living on campus and having a meal plan is not associated with a change in persistence. Within the subgroups there were three that are significantly impacted by having a meal plan:

- Gender
- Race and ethnicity
- Student admit type

Impact by gender: Female students experienced a significant increase in persistence from living on campus and having a meal plan. There are roughly the same number of male and female students with a meal plan, yet the change for male students is not significant.

Impact by ethnicity and race: USU has a high population of White or Caucasian and non-Hispanic or Latino students. For this reason, impact analyses can often detect change in persistence for these groups; however, students of other races or ethnicities rarely have enough student representation to detect a significant change. With this in mind, the analysis found a significant increase in persistence for Caucasian and non-Hispanic or Latino students.

Impact by student admit type: First-time in college students experienced a significant increase in persistence from living on campus. Students who are readmitted students or transfer students did not experience a significant change in persistence from living on campus and having a meal plan.

STUDENT GROUPS THAT APPROACHED SIGNIFICANCE

Significance is measured with significance testing (p-value less than or equal to 0.05) and confidence intervals (lower bound greater than 0). Categories approach statistical significance when the p-value is near 0.05 and negative lower bounds of CI are near 0. Overall, the evaluation of meal plans met the criteria for approaching near significance, with a p-value of 0.05 and a lower bound of -0.01. Additionally, the analysis uncovered some subgroups that approached statistical significance; namely:

- Full-time students
- Students with all on-ground courses
- Incoming students with 0 terms completed

Additional efforts to understand and work with these student segments would improve the impact of meal plans on persistence.

Fine-tuning programming relationship between persistence and strategic marketing of these groups would likely strengthen the association between meal plan and persistence.
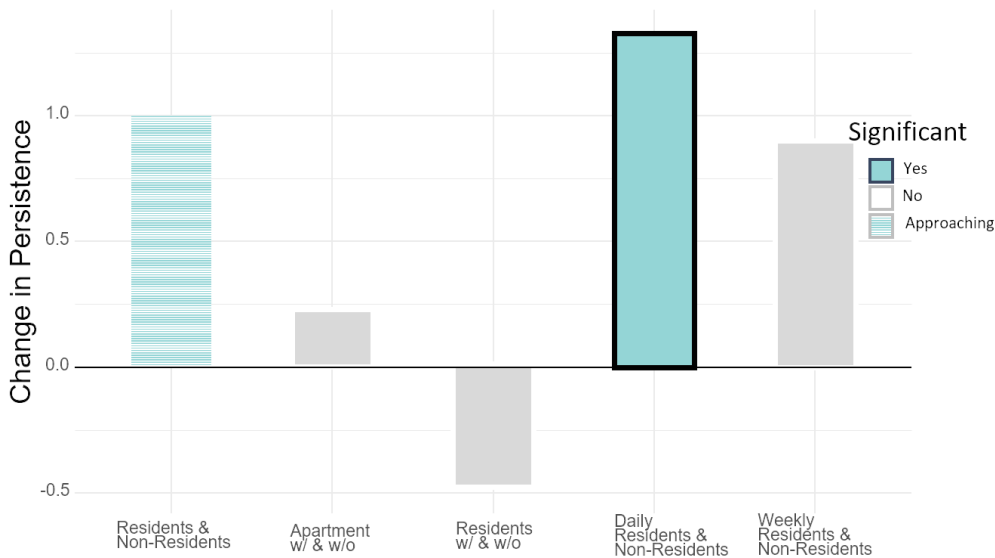
Additional Analyses

COMPARING RESIDENTS

Several living situations on campus do not require meal plans, yet a meal plan can be beneficial to any student who has one. Two analyses compared different resident groups; residents with and without a plan and residents in apartment style dorms without a meal plan. Figure 3 shows the results between meal plan and residential style.

Residents with any plan & residents without: When residents with meal plans were compared to similar residents without meal plans, the analysis was non-significant.

Apt. & Meal Plans: Comparing students who live in apartment style dorms with and without a meal plan provides an ideal way to look at the impact of meal plans. Because meal plans are optional, we can isolate meal plans as outcomes. The difference between apartment residents with and without a meal plan was non-significant. Remember, that the impact of living in an apartment style housing is significantly associated with persistence. For that reason, we can say that the benefit of living in an apartment is not directly attributable to having a meal plan.

IMPACT BETWEEN RESIDENTS AND NON-RESIDENTS

Three analyses looked at the impact of having a meal plan between residents and non-residents:

1. any plan to non residents

2. weekly plans to non residents

3. daily plans to non-residents

Any meal plan: The results described above (pages 1-4) show the impact between students who have any plan and non-residents. Briefly, the analysis approached significance. Several student groups were impacted significantly, see Table 1 for details.

Weekly meal plans: Meal plan type was divided by quantity of meals. Meal plans that allowed students to eat on campus weekly, but not daily were considered for this analysis. Weekly plans were not significantly associated with persistence.

Daily meal plans: Students who ate on campus every day experienced a significant increase in persistence compared to similar students who lived off campus and did not have a meal plan. The increase in persistence was associated with retaining an estimated 13 students each year. This retention is estimated to have equated to $61,796.41 in net retained tuition each year.

Within the analysis were several student segments that benefited from having a daily meal plan (see Table 2).

Among these subgroups there were several findings that are uninteresting: undergraduates and Caucasian students. There were also several findings that confirm your understanding of your "type" of students: full-time, all on-ground, first time in college, females, and incoming students. Interestingly, there were some student segments that are less common place: STEM majors and bottom persistence quartiles students.

Student Subgroup Impact

TABLE 4:

Student Subgroups Experiencing a Significant Change From Participating

N	Student Group**	Participant Persistence	Comparison Persistence	Difference	CI	Change in People/ Year
1,892	Overall	89.20%	86.39%	2.74%	1.99%	13
1,867	Undergraduate Students	89.13%	86.28%	2.78%	2.01%	13
1,867	Not Hispanic or Latino	89.25%	86.41%	2.79%	2.00%	13
1,740	Full-time Courses	90.32%	88.28%	2.14%	1.98%	9
1,651	All On-Ground Status	89.43%	86.34%	3.01%	2.12%	13
1,622	White or Caucasian	89.37%	86.42%	2.86%	2.12%	12
1,615	First Time in College	89.57%	86.53%	2.98%	2.13%	12
980	0 Terms Completed	91.95%	88.40%	3.49%	2.55%	9
732	Female Students	90.63%	87.20%	3.37%	3.12%	6
704	STEM Major	91.62%	88.32%	3.32%	3.08%	6
168*	Bottom Persistence Prediction Quartile (1st - 24th Percentiles)	72.22%	59.41%	12.75%	9.68%	5

* Student segments with less than 250 matched pairs are considered too small to make an accurate estimate of the impact of programming on persistence

** Student group definitions available in Appendix F

The Lifecycle of sustainable analytics

FORMAL ANALYTICS → **FULFILLMENT OF HUMAN NEEDS**

DATA COLLECTION & ACCESS → DATA SCIENCE & MODELING → VISUALIZATION & WORKFLOWS → SOCIALIZATION OF TOOLS → EMPOWERMENT OF HUMAN ACTION → ADVOCACY & INNOVATION
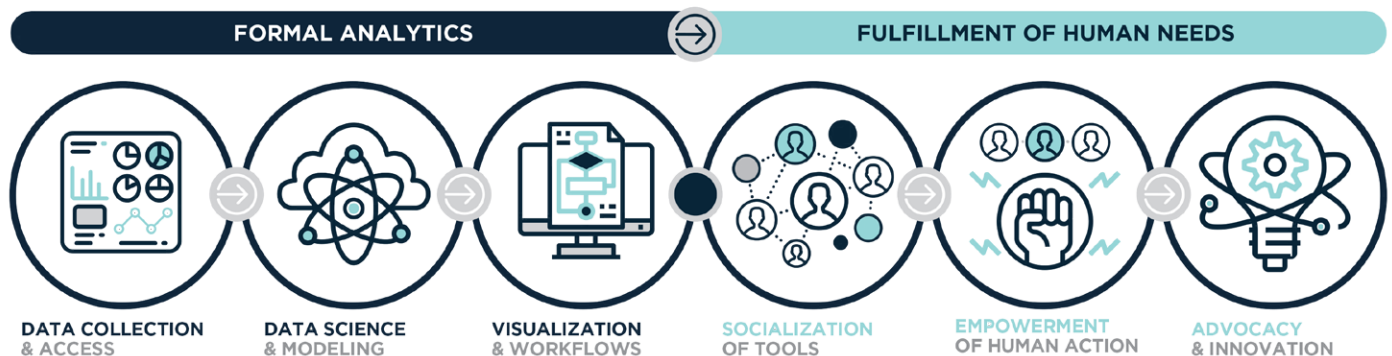
FIGURE 12
The Lifecycle of Sustainable Analytics.

Insights & Next Steps

A major goal of analytics is to identify areas for improvement and innovation. To be successful, all initiatives must consider the role of formal analytics and role of the humans needs. The Lifecycle for Sustainable Analytics presents the major domains within any successful analytics initiatives. It requires sound data science practices on the left-hand and proactive human relations on the right. Together the six do-mains support the development and utilization of analytics insights for improvement and innovation.

Housing & Resident Life Innovation

Housing & Residence Life is regularly innovating to support student success. Most notably, Housing & Residence Life has grown and modernized substantially across the time frame included in the analysis. New constructions, renovations, and purchases have increased the number of beds available for students. It has also created some disruption to normal housing activities. Specifically, disruption were likely to have been felt in the Towers and Central Campus housing facilities due to construction and renovations.

Blue Square and Darwin Apartments were the newest additions to Housing & Resident Life for this analysis. Both housing facilities were non-significant but trending in the positive direction. These facilities still have developing Resident Assistant (RA) teams. Continued development of student supports are expected to improve the impact on student persistence.

Housing will continue to strengthen programming at each USU housing facility to improve student outcomes. It is expected that the improved housing facilities and resident supports will continue to support student persistence towards graduation.

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Appendix A

THEORETICAL FOUNDATION FOR IMPACT ANALYSES: INPUT, ENVIRONMENT, OUTPUT MODEL (ASTIN , 1993)

STUDENT
ENVIRONMENTS

STUDENT
INPUTS
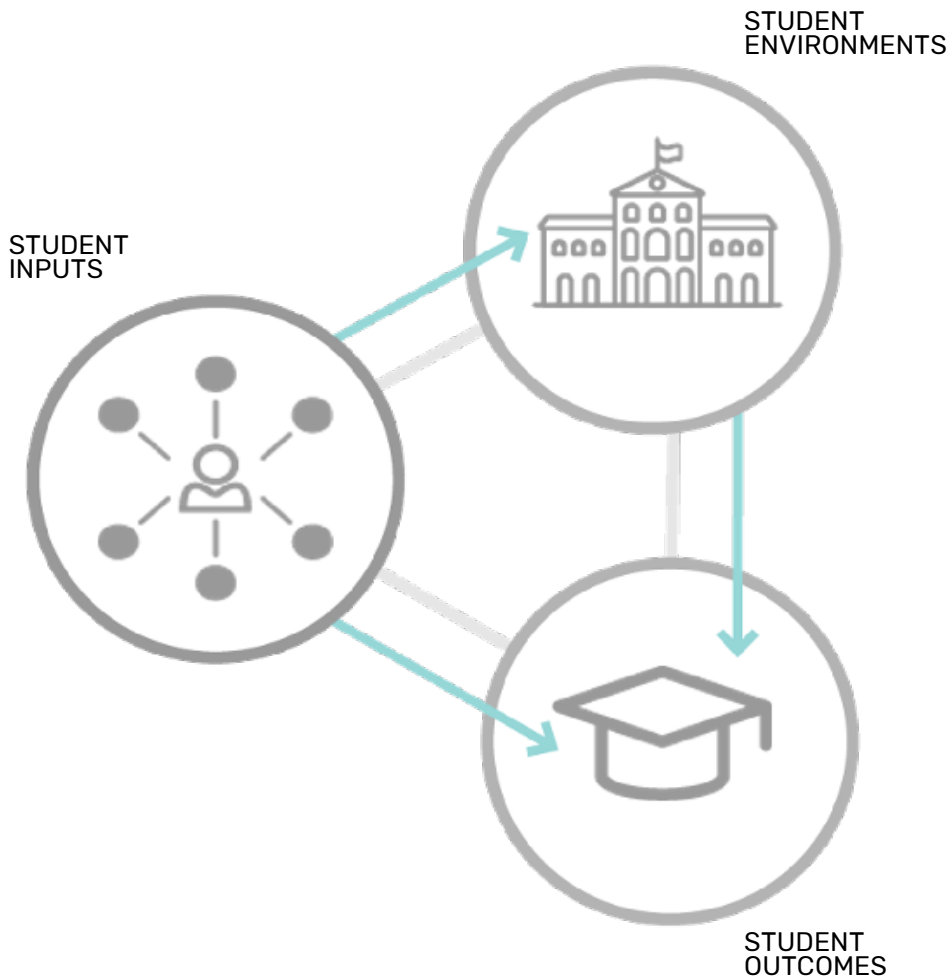
STUDENT
OUTCOMES

Input – Environment – Outcomes

Student success is composed of both personal inputs and environments to which individuals are exposed (Astin, 1993). Impact analysis controls for student input though participant matching on (1) their likelihood to be involved in an environment and (2) their predicted persistence score. By controlling for student inputs, impact analyses can more accurately measure the influence of specific student environments on student persistence.

STUDENT INPUTS

Students bring different combinations of strengths to their university experience. Their inputs influence student life and success, but do not determine it.

STUDENT ENVIRONMENTS

The University provides a diverse array of curricular, co-curricular, and extra-curricular activities to enhance the student experience. Students selectively participate to varying degrees in activities. Student environments influence student life and success, but do not determine it.

STUDENT OUTCOMES

While student success can be defined in multiple ways, a good indicator of student success is persistence to the next term. It means that students are continuing on a path towards graduation. Persistence is influenced by student inputs and University environments.

IMPACT ANALYSIS

An impact analysis can effectively measure the influence of University initiatives on student persistence by accounting for student inputs through matching participants with similar students who chose not to participate.

Appendix B

ANALYTIC DETAILS: ESTIMATING PROGRAMMATIC IMPACT THROUGH PREDICTION-BASED PROPENSITY SCORE MATCHING (PPSM)

Impact analyses are quasi-experiments that compare students who participate in University initiatives to similar students who do not. Students who participate are called participants, students who do not have a record of participation are called comparison students. The analysis results in an estimation of the effect of the treatment on the treated (ETT). In other words, it estimates the effect of participating in University initiatives on student persistence for students who participated. This estimation is appropriate for observational studies with voluntary participation (Geneletti & Dawid, 2009).

Accounting for bias. While ETT is appropriate for observational studies with voluntary participation, voluntary participation adds bias. Specifically, voluntary participation results in self-selection bias, which refers to the fact that participants and comparison students may be innately different. For example, students who self-select into math tutoring (or intramurals or the Harry Potter Club) may be quantitatively and qualitatively different than students who do not use math tutoring (or intramurals or the Harry Potter Club). To account for these differences, reduce the effect of self-selection bias, and increase validity, a matching technique called Prediction-Based Propensity Score Matching (PPSM) is used.

In PPSM, matching is achieved by pairing participating students with non-participating students who are similar in both their (a) predicted persistence and (b) their propensity to participate in an iterative, boot-strapped analysis (Milliron, Kil, Malcolm, & Gee, 2017).

(A) Predicted Persistence. Utah State University utilizes student data to create a persistence prediction for each student. The main benefit to students from the predictive system is an as early alert system; it identifies students in need of additional resources to support their success at USU. A secondary use of the predicted persistence scores are to evaluate the impact on student-facing programs on student success. This is an invaluable practice that fosters accountability, efficiency, and innovation for the benefit of students.

The predicted persistence scores are derived through a regularized ridge regression. This technique allows for the incorporation of numerous student data points, including:

- academic performance
- degree progress metrics
- socioeconomic status
- student engagement

The ridge regression rank orders the numerous covariates by their predictive power. This equation is then used to predict student persistence scores for students at USU. This score is utilized as one point for matching in PPSM.

(B) Propensity to Participate. The second point used for matching in PPSM is a propensity score. Propensity scores reflect a students likelihood to participate in an initiative (Rosenbaum & Rubin, 1983). It is derived through logistic ridge regression that utilizes participation status as the outcome variable. Using the equation, each student is given a propensity score which reflects their likelihood to participate regardless of their actual participation status.

Matching is achieved through bootstrapped iterations that randomly selects a subset of participant and comparison students. Within each bootstrapped iteration, comparison students are paired using 1-to-1, nearest neighbour matching. Matches are created when student predicted persistence and propensity scores match within a 0.05 calliper width. Within the random bootstrapping iterations, all participants are included at least once. Students who do not find an adequate match are excluded from the analysis (for additional details see Louviere, 2020).

Difference-in-Difference. To measure the impact of University services on student persistence, a difference-in-difference analysis is used. A difference-in-difference analysis compares the calculated predicted means from the bootstrapped iteration distributions to the actual persistence rates of participating and comparison students. In other words, the analysis looks at the difference between predicted persistence and actual persistence between the two groups of well-matched students. Statistical significance is measured at the 0.05 alpha level and utilizes confidence intervals. The results reflects the ETT.

Appendix C
ADJUSTED RETAINED TUITION MULTIPLIER

Retained tuition is calculated by multiplying retained students by the USU average adjusted tuition. Average adjusted tuition was calculated in 2018/2019 dollars with support from the Budget and Planning Office. The amounts in the below table reflect net tuition which removes all tuition waivers from the overall gross tuition amounts. Utilizing net tuition provides a more accurate and conservative multiplier for understanding the impact of University initiatives on retained tuition. The table below parses the average adjusted tuition by campus and academic level. The highlighted cell represents the multiplier used in this analysis.

RETAINED TUITION MULTIPLIER CALCULATION

Student Groups	Net Tuition	Number of Students	Average Annual Tuition & Fees
All USU Students	$148,864,384	33,070	$4,501.49
Undergraduates	$131,932,035	29,033	$4,544.21
Graduates	$16,932,349	4,037	$4,194.29
Logan Campus Students	$119,051,003	25,106	$4,741.93
Undergraduates	$107,711,149	22,659	$4,753.57
Graduates	$11,339,854	2,447	$4,634.19
State-Wide Campus Students	$25,941,419	7,964	$3,257.34
Undergraduates	$20,303,215	3,864	$5,254.46
Graduates	$5,638,204	1,590	$3,546.04
USU-E Price & Blanding Students	$3,871,962	2,560	$1,512.49

Appendix D

STUDENT SEGMENTS THAT DID NOT EXPERIENCE A SIGNIFICANT CHANGE IN PERSISTENCE

N	Student Group	Actual Persistence		Difference-in Difference	CI	p-value
		Participants	**Comparison Students**			
5,587	Third Persistence Prediction Quartile (50th - 74th Percentiles)	93.89%	93.39%	0.48%	0.91%	0.3026
5,567	STEM Major	92.36%	91.49%	0.68%	1.00%	0.1778
4,703	Second Persistence Prediction Quartile (25th - 49th Percentiles)	86.01%	84.92%	1.24%	1.40%	0.0824
2,159	Transfer Students	91.02%	89.42%	1.68%	1.71%	0.0531
1,896	Part-time Courses	81.46%	78.80%	2.31%	2.36%	0.0559
1,426	Readmitted Students	91.99%	90.06%	1.54%	2.00%	0.132
758	Asian or Asian American	93.50%	92.37%	1.31%	2.82%	0.3636
532	Two or More Racial Heritages	89.48%	91.00%	0.42%	3.57%	0.8158
519	Unknown Racial Heritage	89.26%	86.60%	0.01%	3.69%	0.9948
209*	Black or African American	89.41%	87.10%	1.46%	5.92%	0.6281
111*	American Indian/Alaskan Native	82.01%	89.36%	-7.56%	9.42%	0.1152
66*	All Online Status	73.47%	71.35%	2.22%	15.34%	0.775
48*	Pacific Islander	85.51%	81.69%	3.62%	12.32%	0.5615
20*	Unknown Undergraduate Type	79.55%	83.76%	0.97%	31.81%	0.9479

* Cells with fewer than 250 matched student pairs are too small for reliable analysis

** Student group definitions available in Appendix F

Appendix E

MATCHING DETAILS

Matching for the analysis resulted in 63.8% of available participants, or 15,730 students, being successfully matched for the analysis. Participating students who did not have an adequate match in the comparison group during the PPSM process were excluded from the analysis. While higher matching is preferred, a 63.8% match is adequate with a large sample size, like those seen in this analysis.

PERSISTENCE MATCHING: Prior to matching samples were 79% similar based on students' predicted persistence (Figure A). Following matching the samples were 98% similar.
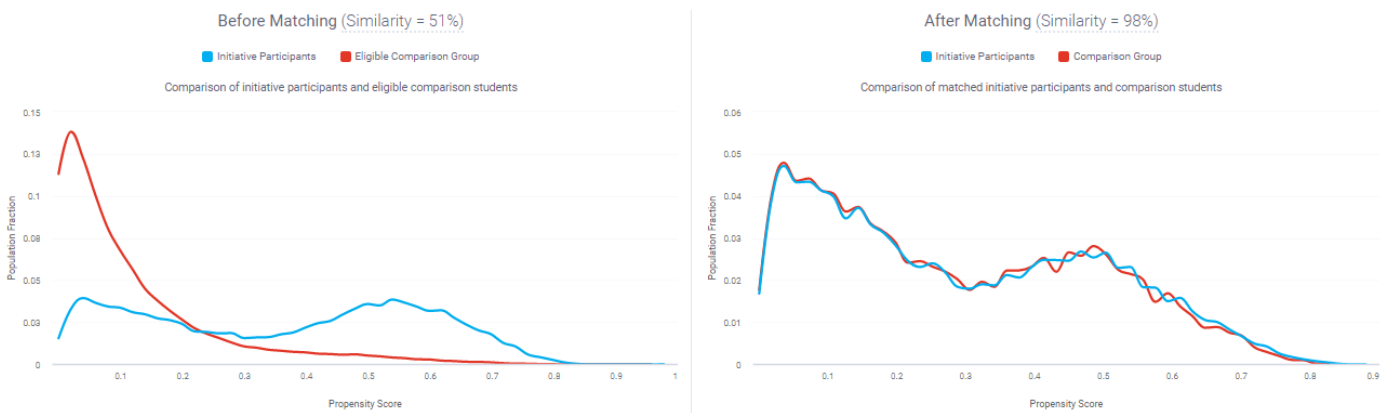
PROPENSITY MATCHING: Participating and comparison students were 51% similar based on propensity score prior to matching (Figure B). Following matching, the similarity in propensity was 98%.

The persistence matching graph (Figure B) illustrates that there was selection bias associated with Housing and Residence Life, i.e. the red and blue lines have very different shapes. Ultimately, a representative sample was used in the analysis; however, the impact of the selection bias should be explored on the analysis.
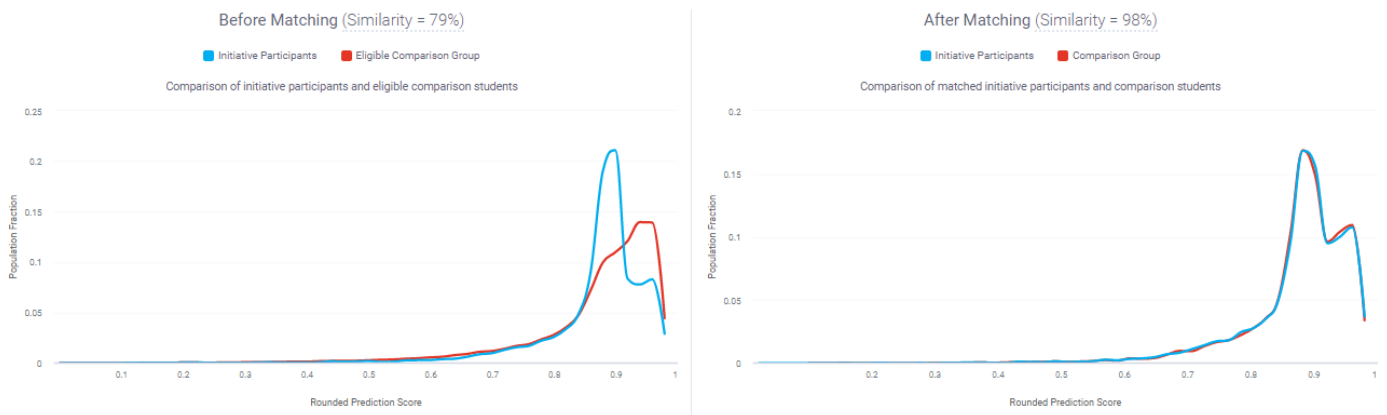
FIGURE A PREDICTED PERSISTENCE: PARTICIPATING & COMPARISON STUDENTS

Participating and comparison students receive scores based on their predicted persistence to the next semester. This score is based on historical data from Utah State University students.

FIGURE B PROPENSITY TO PARTICIPATE BTW PARTICIPATING & COMPARISON STUDENTS

Participating and comparison students receive scores based on their likelihood to participate in the initiative.
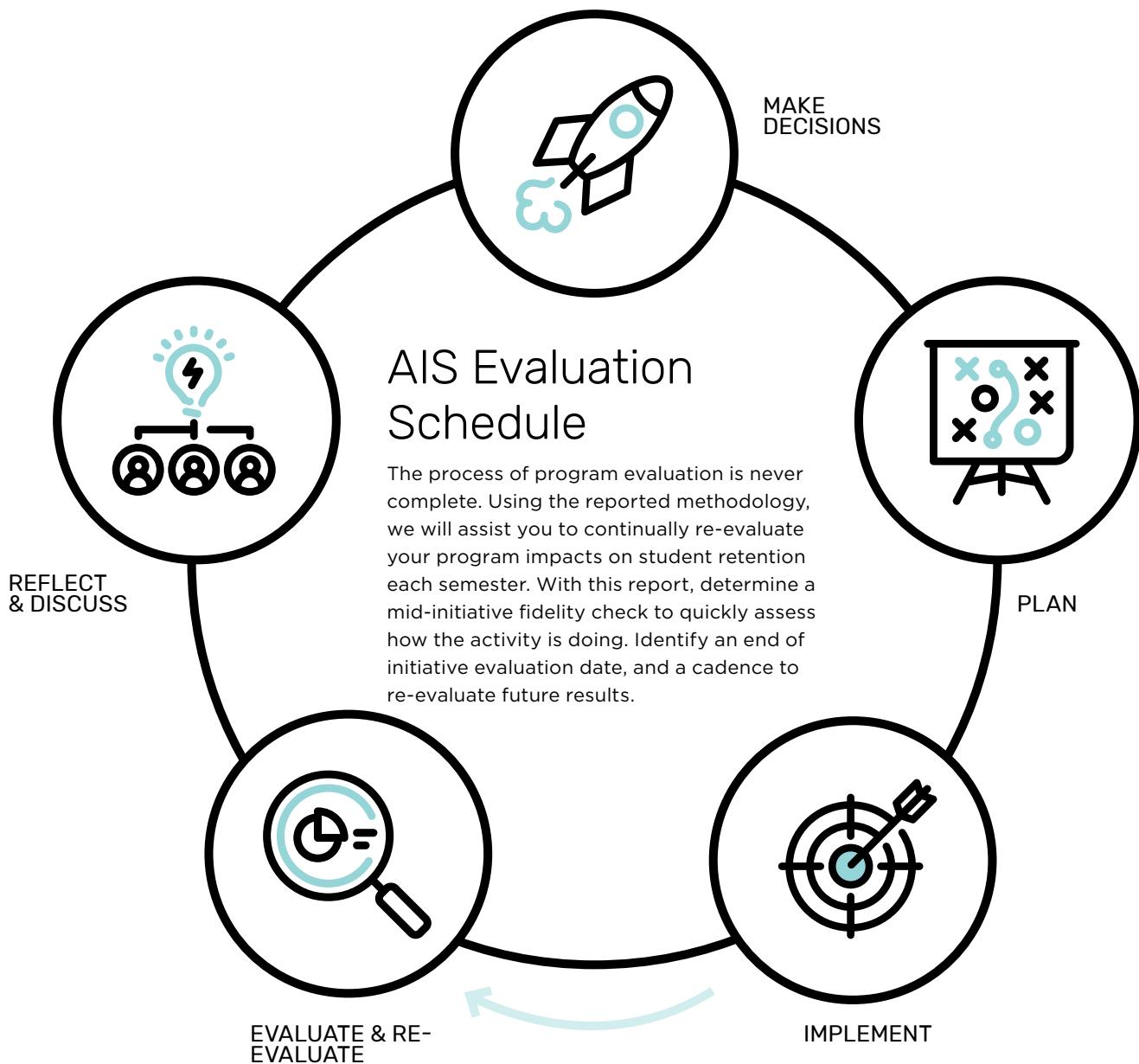
Appendix F
STUDENT SEGMENT DEFINITIONS

Student Subgroup	Definition
0 Terms Completed	Students with 0 terms in their collegiate career completed; incoming freshmen
1 - 3 Terms Completed	Students who have completed 1 to 3 terms in their collegiate career
4+ Terms Completed	Students with 4 or more terms in their collegiate career completed
All On-Campus	Students attending all courses face-to-face
Online or Broadcast	Students attending all courses online or via broadcast
Mixed or Blended Course Modality	Students attending both face-to-face and online or broadcast courses
Full-time Students	Undergraduate students enrolled in 12 or more credits; Graduate students enrolled in 9 or more credits
Part-time Students	Undergraduate students enrolled in less than 12 credits; Graduate students enrolled in less than 9 credits
First Time in College	Students who enter USU as new freshmen, who have maintained continuous enrollment or records of absences (i.e. LOA)
Transfer Students	Students who attended another university prior to attending USU
Readmitted Students	Students who attended USU, left for a time (without filing a LOA), and returned after re-applying to USU
Unknown Undergraduate Type	Students with an unknown admitted type
High School Dual Enrollment	High school students simultaneously taking high school and college courses
STEM	Students with a primary major in science, technology, engineering, or mathematics
Non-STEM	Students with a primary major that is not in science, technology, engineering, or mathematics
Top Persistence Prediction Quartile	The total USU student population is divided so that 25% of students fall in each quartile. The top quartile contains students with the highest predicted persistence (75th – 100th percentile)
Third Persistence Prediction Quartile	The total USU student population is divided so that 25% of students fall in each quartile. The third quartile contains students with higher predicted persistence (50th – 74th percentiles)
Second Persistence Quartile	The total USU student population is divided so that 25% of students fall in each quartile. The second quartile contains students with lower predicted persistence (25th – 49th percentiles)
Bottom Persistence Quartile	The total USU student population is divided so that 25% of students fall in each quartile. The bottom quartile contains students with the lowest predicted persistence (1st – 24th percentile students)
Female	Students identifying as female
Male	Students identifying as male

STUDENT SEGMENT DEFINITIONS [CONTINUED]

Student Subgroup	Definition
Non-Hispanic or Latino	Students who do not identify as Hispanic or Latino
Hispanic or Latino	Students who identify as Hispanic or Latino
Race: Two or More	Students who identify with two or more races
Race: Unknown	Students who did not provide race information
Race: Asian	Students who identify as Asian
Race: Black or African American	Students who identify as African American
Race: Pacific Islander	Students who identify as a Pacific Islander
Race: American Indian/ Alaskan Native	Students who identify as American Indian or Alaska Native
Race: White or Caucasian	Students who identify as White or Caucasian

Appendix G

UTAH STATE UNIVERSITY'S EVALUATION CYCLE

MAKE DECISIONS

PLAN

AIS Evaluation Schedule

The process of program evaluation is never complete. Using the reported methodology, we will assist you to continually re-evaluate your program impacts on student retention each semester. With this report, determine a mid-initiative fidelity check to quickly assess how the activity is doing. Identify an end of initiative evaluation date, and a cadence to re-evaluate future results.

REFLECT & DISCUSS

IMPLEMENT

EVALUATE & RE-EVALUATE

EVALUATE & RE-EVALUATE

Get the data to AIS and we can run an evaluation on persistence. For goals that don't include persistence AIS can assist you in finding resources to measure your improvement.

REFLECT & DISCUSS

Consider the report and the evaluators insights to produce discussion within your department.

MAKE DECISIONS

Formulate possible actions to improve your program. Select actions that align with your program goals.

PLAN

Make concrete plans to apply your decisions. Determine the who, where, and when of your actions.

IMPLEMENT

Put your plans into actions. Remember to periodically check the progress of your plans as they are being implemented.