PREDICTIVE ANALYTICS TO EXPLAIN RESIDENT GRADE POINT AVERAGE

An Undergraduate Research Scholars Thesis

by

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ABSTRACT

Predictive Analytics to Explain Resident Grade Point Average

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Predictive analytics have traditionally been used to anticipate academic standing in college students using variables such as the American College Test (ACT) scores and/or School and College Ability Test (SAT) scores, high-school rank, gender, ethnicity, social cognitive factors, etc. While the use of predictive analytics in higher education has expanded to include variables of identity, such as gender and socioeconomic status, and social and emotional factors, these elements have seldom been explored in the context of housing and residential environment and their impact on academic performance. This study addresses this gap by recommending the inclusion of enrollment level and credit hours to aid in predicting academic performance on-campus.

DEDICATION

I dedicate this thesis to every on-campus student who comprise the heart of their universities.

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I would like to thank my advisors, Dr. Lori Moore and Mr. Dustin Grabsch, for their guidance and support throughout the course of this research.

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Finally, I would like to thank my parents for their relentless encouragement and assistance throughout my university career.

NOMENCLATURE

ACT	American College Test
APM	Academic Peer Mentor
DARS	Data and Research Services
DRL	Department of Residence Life
GPA	Grade Point Average
GPR	Grade Point Ratio
LLC	Living Learning Community
RA	Resident Advisor
ROTC	Reserve Officer Training Corps
SAT	School and College Ability Test
SPSS	Statistical Package for the Social Sciences
TAPs	Transition Academic Programs
URS	Undergraduate Research Scholars

CHAPTER I

INTRODUCTION

Background

Previous research in the fields of higher education and student affairs has left a significant gap in the literature concerning the relationship between student grade point average (GPA) and housing and residential variables. Research has been done involving previous student academic scores such as American College Test (ACT) scores and School and College Ability Test (SAT) scores and student retention and social and cognitive variables and student retention but variables of housing and residential life have largely been overlooked. Currently, the Department of Residence Life (DRL) at Texas A&M University does little to no academic intervention based on GPA. This leaves residence hall and apartment staff to develop academic intervention at their discretion based off of poor or inaccurate GPA reporting and self-reporting from students. This study hopes to improve upon this practice by providing data for proactive action rather than reactive intervention practices.

For the 2017-2018 school year, Texas A&M University, in College Station, Texas, enrolled approximately 68,603 students. The student enrollment profile is comprised of 2,443 (3.56%) members of the Corps of Cadets who live on-campus, 9,237 (13.46%) students living on-campus (not in the Corps of Cadets), and 56,923 (82.97%) students living off-campus. The DRL at Texas A&M University serves approximately 12,000 students in on-campus residential environments in twenty-five residence halls, two apartment communities, and twelve Corps of Cadets residence halls. These halls are administratively divided between northside, southside,

and White Creek (westside). This system of organization is based on the geographic location on the University's campus in College Station, Texas.

The northside of campus is the location of Clements, Davis-Gary, Fowler-Hughes-Keathley (FHK), Hobby, Hullabaloo, Lechner, Legett, McFadden, Moses, Neeley, Schuhmacher, and Walton residence halls. These halls represent ramp, corridor, balcony, modular, and Hullabaloo hall types. Along with the general on-campus population, these halls house several living learning communities (LLCs) such as the Honors Housing Community in Lechner and McFadden halls.

The southside of campus is the location of Appelt, Aston, Dunn, Eppright, Haas, Hart, Krueger, Mosher, Rudder, and Wells residence halls. These halls represent commons, ramp, and modular hall types. Along with the general on-campus population, these halls house the Engineering LLC in the commons-style halls, Aston, Dunn, Krueger, and Mosher. The southside is also the location of the Texas A&M Corps of Cadets, the university's Reserve Officers' Training Corps (ROTC). The Corps of Cadets is housed in twelve corridor style residence halls. All of the residence halls at Texas A&M University are co-ed with the exception of Underwood, Rudder, and Leggett halls which are female only, and Appelt hall which is male only.

It is important to note the hall types of the residence hall and apartment structures at Texas A&M University. This is because hall types determine the rent rate for a student's housing contract. In the 2017 – 2018 academic year there were three primary rental rates for the residence halls and a separate rent structure for apartments. Ramp halls, which feature primarily two-person rooms with two rooms sharing a bathroom, are the most economical at approximately $1,700 per semester for a double room. Balcony halls, which have a similar set-up to ramp halls, and corridor halls, which feature two-person rooms with a community bathroom, make up the

middle tier at around $2,200 per semester. Finally, on the higher end of the residence hall rent structure are the commons halls, with the same structure as ramp and balcony halls, and modular style halls, which feature two-person rooms with a bathroom, at around $3,200 per semester. In its own tier is Hullabloo Hall which is a standalone hall type. Rates range from $3,900 – $4,900 based on four different floor plans. White Creek apartments have rates by semester which vary from $3,800 – $5,000 depending on one of nine floor plan options. While these rental rates are provided for context, they are not identical to the rates that were in use during the period this study; however, they are helpful in understanding the possible practical significance related to the research findings.

In response to limited resources and an increased focus on data driven initiatives, the present study sought to provide findings that will aid in the allocation of resources to individuals in need (defined for this study as any student who has a cumulative GPA lower than the average for their college or demographic group). Developing predictive analytics to improve resident GPA was thus conceived to aid the DRL with targeted resource allocation and outreach. Originally, the intent was to create a predictive analytical model using available student information to help the DRL focus specialized efforts on a smaller subset of the on-campus student community who might otherwise struggle with their GPA performance.

As a precursor to the literature review (see Chapter II), predictive analytics have traditionally been used to anticipate academic standing in college students using variables such as the American College Test (ACT) and School and College Ability Test (SAT) scores, high-school rank, gender, ethnicity, social cognitive factors, etc. (Bowers, 1970; Hackett, Betz, Casas, & Rocha-Singh, 1992; Noble & Sawyer, 2002). While the use of predictive analytics in higher education has expanded to include variables of identity, such as gender and socioeconomic

status, and social and emotional factors, such as stress patterns, perfectionism, and introversion/extroversion tendencies, these elements have seldom been explored in the context of housing and the residential environment and their impact on academic performance (Thompson, 1993). The present study sought to explore this gap in the literature by examining the potential link between on-campus living and resident GPA.

Developing predictive analytics to improve resident GPA is a study supported by the DRL at Texas A&M University and conducted as part of the Undergraduate Research Scholars (URS) program. The URS program provides undergraduate students the opportunity to conduct original research as well as present at a venue relevant to their field and publish their thesis in Texas A&M's OAKTrust Digital Repository.

Purpose

The purpose of the present study was to analyze housing and residential environment variables along with demographic variables to evaluate their influence on academic success. Academic success, for the purposes of this study, is defined as a student's GPA. This aims to expand current understanding of academic success through the variables that positively or negatively impact GPA. Overall, this study sought to explain GPA performance to the best of its ability, given the accessible historical student data and variables.

Research Objectives

This study sought to address two primary research objectives:

1. Explore housing variables such as permanent/temporary status, housing area, hall type, residence hall, and on/off housing and their effect on student GPA.
2. Explain cumulative GPA performance to the furthest extent possible using housing and basic demographic variables such as gender, race, and enrollment level.

Significance

This study is significant because it addresses a gap in previous research. This is accomplished by considering variables other than previous academic success (e.g. ACT and SAT scores) and demographic variables once admitted to a university setting. Additionally, this research seeks to include housing and residential environment variables to the literature in an effort to explain student academic performance. The ability to predict a student's GPA would enable the DRL to implement targeted outreach and marketing, resource allocation, and stewardship toward students and communities identified as in need through this research.

One example of this potential targeted stewardship lies in the on-campus live-in staff in the residence halls and apartments at Texas A&M University. Student staff such as the Resident Advisors (RAs), student staff that work toward positive in-hall experiences for students, and Academic Peer Mentors (APMs), student staff members who work toward academic support for on-campus students, could implement targeted marketing and programming to students that have been identified as having the potential for academic difficulty. For example, if the model determines gender and hall type as informing variables, then the communities with a larger male or female population and/or the communities in the at-risk hall type could be given an extra APM. The ability to implement these initiatives early in a student's on-campus experience may positively impact their GPA as well as overall experience at Texas A&M University.

Limitations

This study was limited to the variables available to the research team provided by the university's Data and Research Services (DARS) as well as the university's historical housing database which has since been discontinued. Even though five years of housing and student data was collected from 2012-2016, only two complete cohorts were created due to limitations of the

data. This lack of accessible historical data caused a smaller-than-anticipated dataset at the beginning of this study. To illustrate, the historical housing database only included a small amount of data due to its limited fields and server space.

An additional limitation is that the census data that was utilized in this study did not clearly identify semester or cumulative student GPA. This limitation caused some student data to be missing or incomplete over the academic year, thus leaving it difficult to definitively determine if a student withdrew, graduated or otherwise left the university, and consequently needed to be removed from the dataset. Due to this limitation, the research design had to be changed to ensure a more complete study. To illustrate this concern, if the research team were examining a spring semester, the GPA from the following fall would have to be used with the spring semester and so on based on twelfth class day reporting. This mode of operation required that the GPA listed for a fall semester must be used to represent the previous spring semester and so on.

In summary, ideally for this study a full five cohorts as well as variables such as geographic area, factors influencing student withdrawal, a student's length of time living on-campus, the date a student's housing application was submitted, and a student's move-in date would also have been produced for inclusion. These additional variables would have yielded more housing and residential life variables for analysis in determining student success. Despite these limitations, the accessible data which was prepared for use in the study was determined to be adequate to address the primary research questions.

CHAPTER II

LITERATURE REVIEW

Overview

Predictive analytics are typically used in the fields of higher education and student affairs to predict student success before students are admitted to a university. While this is an important use of predictive analytics, they can also be used to improve student persistence once admitted to a university. Predictive analytics in the field of higher education looks primarily at student retention based on an individual's previous academic record. Within housing and residential life, predictive analytics have been overlooked in their ability to assess student success or retention.

Higher Education

Looking at trends in previous research, studies in higher education predicting academic success have moved toward the efficacy and evaluation of standardized testing prior to college. The primary variables evaluated being the SAT and ACT exam scores. Noble and Sawyer (2002) conducted a study evaluating whether the ACT exam or high-school Grade Point Average (GPA) is a more effective mode of predicting academic success in college. This study used logistic regression to determine the statistical relationship between first-year college GPA and ACT scores and student success in college. Noble and Sawyer found that students with a high-school GPA of 4.0 were likely to have a 3.5 or higher in their college career. However, ACT scores were not significant is determining student success. This study is beneficial due to its large sample size of institutions, 216 in total, and the recognition of cognitive versus non-cognitive factors. The cognitive and non-cognitive variables were defined by the study as academic versus demographic variables, given in the hypothesis (Noble, 2002). While the use of these variables is

important in the determination of a student's readiness to enter a collegiate environment, they fall short in determining a student's academic success once they enter an academic program.

Once a student has been admitted through the use of standardized testing, it is important to analyze the relationship between the admission standard and academic achievement once in college. Bowers (1970) conducted a study analyzing the differences in High School Percentile Rank (HSPR), ACT, and the School and College Ability Test (SCAT; Verbal and Quantitative) between students regularly enrolled at the University of Illinois at Urbana and students that attended as part of the Special Educational Opportunities Program (SEOP). Student mean GPA while at the University of Illinois was analyzed respective of regular versus special courses and gender. While the findings of this study showed that HSPR and SCAT Verbal were strong predictors of GPA for all groups, gender accounted for more variation in results from the four equations used in this study. Bowers (1970) added caution to his findings, emphasizing that differences in coursework and instructor as well as reliability of data could account for differences in equations between regularly admitted students and students enrolled through SEOP.

To fully explore the development of predictive analytics in higher education, it is necessary to evaluate the factors that have been analyzed in connection to student success in the past, as well as their limitations. Hackett, Betz, Casas, and Rocha-Singh (1992) conducted a study analyzing gender, ethnicity, and social cognitive factors, defined by the study as interests, career and academic self-efficacy, and outcome expectations, as they relate to academic achievement in engineering. The data collected showed no significant interactions between gender and ethnicity on academic performance in required engineering courses by way of two-way analyses of variance. However, through regression analyses, students who identified as

Euro-American were more likely to state higher levels of academic self-efficacy, than their Mexican-American counterparts. As one of the first studies to utilize social cognitive variables (e.g. vocational interests, outcome expectations, previous academic quantitative data), the findings show that overall, academic self-efficacy in college can mediate prior academic achievement, gender, and ethnicity (Hackett, 1992). This study also highlighted the need for further data highlighting variables that affect the academic standing of women and people of color, especially in science, technology, engineering, and mathematics (Hackett, 1992). This study by Bowers and Hackett, laid the foundation for the present study and the beginning framework of the initial demographic variables.

Another study which aided in conceptualizing the present study was Pascarella and Terenzini (1983). This study used path analytics to evaluate Tinto's (1975) existing model dealing with persistence/withdrawal patterns after a student's first year in college. Tinto's model dealt primarily with a student's "degree of fit" with their university and used background traits as well as self-reported views of their school to determine a student's likelihood of persisting further than the first year of college. Pascarella and Terenzini's (1983) study sought to test the validity of this model as well as the purported link between integration and commitment. The study found that background characteristics and initial commitments had very little relation to a student's persistence whereas variables that occur after a student arrives on-campus such as peer-group interactions, interactions with faculty, faculty concern for students, and academic and intellectual development (1983) are much greater indicators of persistence/withdrawal patterns. This study, while new in thought at the time, proved consistent with Tinto's study in 1975 (Pascarella & Terenzini, 1983). Pascarella and Terenzini's work begins to analyze a student's

on-campus experience in the classroom, this is vital groundwork to begin analyzing other on-campus variables.

Additionally, Pritchard and Wilson (2003) used predictive analytics - similar to the studies above - but expanded upon predictors used, recognizing that “the major causes of attrition in first-year college students are emotional rather than academic factors” (p. 18). The study found that there is no single factor or set of factors that can predict a student’s success or attrition pattern, rather a multitude of factors that combine to assist or impede a student's ability to adjust to the college environment. These emotional factors were broken into two categories, emotional and social health. Emotional health was further broken into the subcategories of stress, perfectionism, self-esteem, coping tactics, affective states, and optimism. Social health was subdivided into introversion/extroversion tendencies, and alcohol behaviors. Ultimately, the Pritchard and Wilson study further implores researchers and scholars to consider a multitude of variables when working to predict student success. This begs the question then, what variables might housing and residence life provide in order to better understand and predict student success in college?

Housing and Residence Life

A comprehensive review of the last ten years of the *Journal of College and University Student Housing* by the Association of College and University Housing Officers-International, the leading journal of college and residential living was conducted to provide a contextual basis for the above question. After review of the ten years of published material, little to no work was found that contributes to the proposed research questions in the context of housing and residence life, therefore suggesting a gap in the literature.

These studies, while integral in the use of predictive equations in higher education, are only tangentially beneficial to the study of housing and its relation to academic success. Thompson, Samiratedu, and Rafter (1993) bring the use of predictive equations into a residential point-of-view in their study analyzing how first-time freshman GPA is affected by the choice to live on- or off-campus for the entirety of a student's freshman year. The variables analyzed in this study were admission type, race, gender, and residence (on- or off-campus) and were compared to find a student's mean GPA, mean hours, and retention. Thompson, Samiratedu, and Rafter (1993) found that students who were admitted under the developmental category, defined as "those who do not meet regular requirements for regular admission to a university because of inadequate skills in reading, composition, or mathematics" (p.42), showed significantly higher academic performance and progress when living on-campus versus their off-campus counterparts. Students who were regularly admitted to the university did not show a higher mean GPA, but presented greater progress by hours and higher retention rates.

This lack of understanding as to which, if any, housing variables ought to be included in predicting student success is troubling. The Thompson, Samiratedu, and Rafter (1993) study as well as the American Council for Education (1937) posit benefits for on-campus living. For instance, the American Council of Education (1937) shows that on-campus students reap academic success benefits such as higher GPAs when compared against their off-campus peers, report higher satisfaction with their college experience and have higher retention and graduation rates to name a few. These studies leave the ground fertile for more investigation into the role housing and residential life programs play in overall student success in college.

CHAPTER III

METHODS

Research Design

This study employed a quantitative methodology. With the assistance of the DRL, historical data was extracted from existing university records from the spring semester of 2012 to the spring semester of 2016. The individual semesters contained in the original data were put into four separate cohorts of students. This was to enable an analysis of a student's academic record for a complete academic year rather than by a single semester since the research team was most interested in the cumulative GPA performance of a full academic year to illustrate persistence. The four cohorts which were prepared for analysis included: Fall 2012-Spring 2013, Fall 2013-Spring 2014, Fall 2014-Spring 2015, and Fall 2015-Spring 2016.

The historical data included the variables of student name, student identification number, semester the data was collected, class year, major, college, gender, race, hall, grade point average, credit hours completed at the university, and whether the student lived on or off campus. Based on this information, researchers created the variables of hall-type and permanent/temporary housing status based on information that could be determined from the original data. After this step, identifiable information like student name and ID number were removed from the dataset for the purposes of analysis. In order to better understand the dataset included in the analysis, variable descriptions are presented before depicting the makeup of the population and sample. To conclude, the type of quantitative data analysis employed will also be discussed as it relates to each of the primary research questions.

Study variables used in this study included college, enrollment level, gender, hall, hall type, hours, major, permanent or temporary status, race, residency, and semesters on-campus pulled from existing data from the DRL, DARS, and researcher created variables. The researcher created variables of hall type and permanent and temporary housing status by examining the available data. For example, the variable hall type was manually added after determining the hall a student lived in and connecting that hall to its respective type. Table 1 presents descriptions and options of the variables present in this study.

Table 1 Study Variables and Descriptions

Variable Name	Description	Option
Gender	The self-reported demographic group of a student	Male, Female, Unknown
Race	The self-reported demographic group of a student	White, American Indian Only, Asian Only, Black Only + 2 or more/1 Black, Hispanic or Latino of any Race, Native Hawaiian Only, 2 or more/excluding Black, International, Unknown or Unreported
Enrollment Level	A student's university-given designation based on academic hours completed	Freshman (U1), Sophomore (U2), Junior (U3), Senior (U4), Post-Baccalaureate Student (U5), Graduate Student (G6, G7, G8, G9), Veterinary Student (V1, V2, V3), Law Students (L0, L1, L2, L3), Unknown
College	The academic college or school that a student belongs to through their major's affiliation	Agriculture, Architecture, Business, Education, Engineering, Geosciences, Government, Liberal Arts, Nursing, Sciences, Biomedical, Transition Academic Programs (TAPs), Unknown, Galveston, Interdisciplinary, Non-Degree Seeking, Unknown
Major	A student's course of study	E.g. Biomedical Science, Performance Studies, English, Animal Science
Hours	The number of academic credit hours completed by a student	U1=0-29 Hours, U2=30-59 Hours, U3=60-89 Hours, U4=90+ Hours
Residency	The status of a student as living either on-campus, off-campus, or living in Corps of Cadets housing	On-Campus, Off-Campus, Corps of Cadets

Hall Type	The style of building and accommodation that the available residence halls are categorized into for administrative and rent-structures	Corridor, Commons, Balcony, Apartments, Hullabaloo
Hall	The on-campus residence of a student during a long-semester (fall and/or spring) at Texas A&M University	Appelt, Aston, Briggs, Clements, Davis-Gary, Dunn, Eppright, Fountain, Fowler, Gainer, Haas, Harrell, Harrington, Hart, Hobby, Hughes, Hullabaloo, Keathley, Kiest, Krueger, Lacy, Lechner, Legett, Leonard, McFadden, Moses, Mosher, Neeley, Rudder, Schuhmacher, Spence, Underwood, Utay, Walton, Wells, White, Whiteley, Gardens
Semesters On-Campus	Whether a student lived on-campus for one or two long-semesters (fall and/or spring) during an academic year	0, 1, 2
Permanent/Temporary	Permanent housing status indicates that a student is in their assigned room for the semester and temporary indicates that the student will be moved to their final placement when the space is available	Permanent, Temporary

Population and Sample

The overall population of this study is every student in a college or university setting within residential housing. The accessible population is 98,737 students enrolled at Texas A&M University, College Station, Texas, between spring 2012 – spring 2016. Even though five years of data were retrieved, only two complete cohorts of students who persisted from August – May were included in the analysis. This was because the four cohorts were needed to clean the dataset of graduating students, students who withdrew, and to access the applicable cumulative GPA which the university reports the following semester. The cohorts were used to determine if a student persisted. Persistence for this study is defined as a student who remains in a university or

college from the beginning of the fall semester until the conclusion of the spring semester. Tables 2-6 describe the accessible population used in the study followed by a similar table of only on-campus students with an enrollment level of U1.

In terms of gender, Table 2 presents that the total sample used in this study had more male students, representing (53%, n=52,174) of the sample. In terms of on-campus U1 students, the population was comprised of more females (52%, n=3,243).

Table 2 Gender

Gender	Frequency	Percentage
Male	52,174	52.84%
Female	46,563	47.16%
Total	**98,737**	**100.00%**

In terms of enrollment level across the accessible population (see Table 3), more students were designated as U4 than any other designation. Students enrolled at Texas A&M University were mostly U4 students (31%, n=31,266). The next largest group was U3 students representing 18% (n=18,274) of the population, then U2 representing 16% (n=16,173), and U1 representing 12% (n=12,138) of the population. The majority of on-campus students are classified as U1 students with 40% (n=2,732) of on-campus students being designated as U1.

Table 3 Enrollment Level

Enrollment Level	Frequency	Percentage
U1	12,138	12.29%
U2	16,173	16.38%
U3	18,274	18.51%
U4	31,266	31.67%
U5	143	0.14%
G6	478	0.48%
G7	10,830	10.97%
G8	7,487	7.58%
G9	229	0.23%
I0	136	0.14%
U0	36	0.04%
V1	267	0.27%
V2	247	0.25%
V3	255	0.26%
I6	2	0.00%
L0	3	0.00%
L1	435	0.44%
L2	172	0.17%
L3	164	0.17%
Total	**98,737**	**100%**

Texas A&M University has eleven primary colleges, not including Transition Academic Programs and the Texas A&M University Galveston branch campus, interdisciplinary students, and non-degree seeking or students with an unknown college (see Table 4). The two largest colleges were the College of Engineering (21%, n=20,986) and the College of Liberal Arts (14%, n=14,535.) The two smallest designations, not including students with an unknown college, were students in interdisciplinary programs (0%, n=11) and Galveston students (0.01%, n=563).

Table 4 College

College	Frequency	Percentage
Agriculture	13,899	14.07%
Architecture	3,285	3.34%
Business	10,126	10.26%
Education	11,126	11.27%
Engineering	20,986	21.25%
Geosciences	1,922	1.95%
Government	793	0.80%
Liberal Arts	14,535	14.72%
Nursing	7,236	7.33%
Sciences	4,603	4.66%
Biomedical	5,321	5.39%
Transition Academic Programs	2,483	2.51%
Unknown	19	0.02%
Galveston	563	0.57%
Interdisciplinary	11	0.01%
Non-Degree Seeking	1,664	1.69%
Total	**98,737**	**100.00%**

In terms of residency, Table 5 presents that the majority of Texas A&M University students live off-campus (81%, n=80,199). The total on-campus population, including the Corps of Cadets, represents 19% (n=18,538) of all students. From here forward, on-campus refers to residents who reside in either the residence halls, apartments, or the Corps of Cadets at Texas A&M University.

Table 5 Residency

Campus	Frequency	Percentage
Residence Halls and Apartments	14,573	14.76%
Corps of Cadets	3,965	4.02%
Off-Campus	80,199	81.22%
Total	**98,737**	**100.00%**

The majority of students living in Texas A&M University's residence halls and apartments (see Table 6) live in modular hall style (31%, n=5,368) or corridor style halls (28%, n=4,895). The smallest hall types are apartments (3%, n=584) and Hullabaloo (6%, n=1,044).

Commons (23%, n=4,070) and balcony (8%, n=1,405) style halls are the mid-size communities on-campus.

Table 6 Hall Type

Hall	Frequency	Percentage
Corridor	4,895	28.19%
Commons	4,070	23.44%
Balcony	1,405	8.09%
Modular	5,368	30.91%
Apartment	584	3.36%
Hullabaloo	1,044	6.01%
Total	**17,366**	**100.00%**

Data Analysis

To begin with, descriptive statistics were run on the dataset in Microsoft Excel to determine percentages, counts, and frequencies related to the population. This aids in understanding the make-up of the accessible population and will aid in the generalizability of the research findings (Creswell, 2014). The first research question sought to address whether housing variables correlate with student GPA. To answer this question, correlation analysis was conducted using the study variables. Study variables were run as independent variables and student cumulative GPA was the dependent variables using the Statistical Package for the Social Sciences (SPSS).

The second research question sought to answer the extent to which housing and basic demographic variables explain GPA performance. Stepwise linear regression analysis was run on major, gender, race, hall, campus, hours, year, class, hall type, permanent or temporary status, college, and semesters on-campus against the dependent variable of cumulative GPA using SPSS. Stepwise linear regression is a method of regressing multiple variables while removing unnecessary data (Cresswell, 2014). First, both complete cohorts comprised of all Texas A&M University students was regressed against different combinations of variables to determine

correlation between the historical data, housing variables, and student performance. Then, a second analysis using stepwise linear regression was run on only on-campus, U1 students. Results from both tests are presented below in findings.

CHAPTER IV

FINDINGS

Descriptive statistics were used to explore the relationship between demographic and housing variables and GPA. The overall mean of student's cumulative GPA included in this study was 3.15 (*SD*=0.58). Mean GPA by demographic and housing variables are presented below.

When examining GPA by sample cohort, the GPAs were almost identical with the 2013-2014 cohort having a mean GPA of 3.14 (*SD*=.59) and the 2014-2015 cohort having a mean GPA of 3.15 *(SD*=.58) (See Table 7).

Table 7 Mean GPA by Sample Cohort

Cohort	Mean	N	SD
2013-2014	3.14	45,315	0.59
2014-2015	3.15	47,947	0.58
Total	**3.15**	**93,262**	**0.58**

Mean GPA by gender of the sample cohort are presented in Table 8. Students who self-reported as male had a mean GPA of 3.1 (*SD*=0.56). Students who self-reported as female achieved a mean GPA of 3.19 (*SD*=0.56).

Table 8 GPA of all Enrollment Levels by Gender

Gender	Mean	N	SD
Female	3.19	44,194	0.56
Male	3.10	49,067	0.60
Unknown	3.34	1	0.00
Total	**3.15**	**93,262**	**0.58**

Mean GPAs by gender of U1 students who lived on-campus are presented in Table 9. Students who self-reported as female had a mean GPA of 3.04 (*SD*=0.63). Students who self-reported as male showed a mean GPA of 2.95 (*SD*=0.68).

Table 9 GPA of U1 On-Campus Students by Gender

Gender	Mean	N	SD
Female	3.04	7,168	0.63
Male	2.95	7,005	0.68
Total	**3.00**	**14,173**	**0.66**

Of the entire sample, students who identified as two or more racial groups, excluding black, had a mean GPA of 3.58 (*SD*=0.42), as shown in Table 10. Following this group the next highest performing groups were unknown or unreported racial category *(M*=3.42, *SD*=0.50) and students who identified as white (*M*=3.16, *SD*=0.56). The group with the lowest GPA (*M*=2.88, *SD*=0.65) was students who identified as black only (or black with two or more other racial categories). Students who identified as Hispanic or Latino of any race (*M*=2.94, *SD*=0.61) and students who identified as native Hawaiian only (*M*=2.97, *SD*=0.57) had slightly higher GPAs but were still among the lowest performing students.

Table 10 GPA of all Enrollment Levels by Race

Race	Mean	N	SD
White	3.16	59,216	0.56
American Indian Only	3.10	251	0.55
Asian Only	3.13	4,502	0.59
Black Only + 2 or more/1 Black	2.88	3,094	0.65
Hispanic or Latino of any Race	2.94	15,716	0.61
Native Hawaiian Only	2.97	73	0.57
2 or more/excluding Black	3.58	8,032	0.42
International	3.10	1,919	0.59
Unknown or Unreported	3.42	459	0.50
Total	**3.15**	**93,262**	**0.58**

Of U1 students who lived on-campus (see Table 11), students who reported an unknown race or did not report a racial category had the highest GPA (*M*=3.30, *SD*=0.47). Following this group, the next highest performing groups were white students (*M*=3.12, *SD*=0.62) and students who identified as two or more racial groups excluding black (*M*=3.08, *SD*=0.75). The group with the lowest GPA (*M*=2.58, *SD*=0.68) was students who identified as black only (or black with two or more other racial categories). Students who identify as Hispanic or Latino of any race (*M*=2.80, *SD*=0.65) and students who identified as native Hawaiian only (*M*=2.89, *SD*=0.65) had slightly higher GPAs but were still among the lowest performing students.

Table 11 GPA of U1 On-Campus Students by Race

Race	Mean	N	SD
White	3.12	8,084	0.62
American Indian Only	2.90	30	0.64
Asian Only	3.07	982	0.65
Black Only + 2 or more/1 Black	2.58	667	0.68
Hispanic or Latino of any Race	2.80	3,872	0.65
Native Hawaiian Only	2.89	13	0.71
2 or more/excluding Black	3.08	145	0.75
International	3.03	356	0.69
Unknown or Unreported	3.30	24	0.47
Total	**3.00**	**14,173**	**0.66**

The residence hall or apartment with the highest mean GPA across all enrollment levels was Lechner Hall (*M*=3.47, *SD*=0.55) followed by McFadden Hall (*M*=3.42, *SD*=0.55) and Clements Hall (*M*=3.23, *SD*=0.69), as shown in Table 12. The residence hall or apartment with the lowest GPA across all enrollment levels was Keathley Hall (*M*=2.70, *SD*=0.72). Along with Keathley Hall, Moses (*M*=2.74, *SD*=0.66) and Walton (*M*=2.74, *SD*=0.66) halls also revealed low GPAs.

Table 12 GPA of all Enrollment Levels by Residence Hall

Hall	Mean	N	SD
Appelt	2.92	558	0.68
Aston	3.06	924	0.61
Briggs	2.94	361	0.51
Clements	3.23	436	0.69
Davis-Gary	2.95	228	0.58
Dunn	2.94	884	0.65
Eppright	2.99	448	0.64
Fountain	2.99	398	0.50
Fowler	2.90	438	0.63
Gainer	2.92	400	0.48
Haas	2.99	501	0.66
Harrell	3.02	390	0.50
Harrington	2.98	399	0.48
Hart	2.93	508	0.62
Hobby	3.12	437	0.60
Hughes	3.10	177	0.55
Hullabaloo	3.16	634	0.61
Keathley	2.70	464	0.72
Kiest	2.90	331	0.51
Krueger	2.97	866	0.65
Lacy	2.95	180	0.46
Lechner	3.47	399	0.55
Legett	3.03	285	0.58
Leonard	2.88	190	0.48
McFadden	3.42	449	0.55
Moses	2.74	422	0.66
Mosher	2.84	1,243	0.74
Neeley	3.08	499	0.59
Rudder	3.06	457	0.61
Schuhmacher	2.82	288	0.62
Spence	2.92	343	0.48
Underwood	3.13	570	0.60
Utay	2.98	364	0.52
Walton	2.74	509	0.66
Wells	3.14	446	0.57
White	2.90	404	0.51
Whiteley	2.91	388	0.48
Gardens	3.10	557	0.55
Total	**2.99**	**17,801**	**0.62**

The residence hall or apartment with the highest mean GPA for U1 students was Lechner Hall (*M*=3.47, *SD*=0.55) followed by McFadden Hall (*M*=3.42, *SD*=0.55) and Clements Hall (*M*=3.23, *SD*=0.69) (see Table 13). The residence hall or apartment with the lowest GPA across all enrollment levels was White Hall (*M*=2.43, *SD*=0.47). With White Hall, Harrington Hall (*M*=2.51, *SD*=0.50) showed low GPAs and Gainer (*SD*=0.73), Leonard (*SD*=0.63), and Whiteley (*SD*=0.62) halls all showed a GPA of 2.56.

Table 13 GPA of U1 On-Campus Students by Hall

Hall	Mean	N	SD
Appelt	2.92	558	0.68
Aston	3.06	924	0.61
Briggs	2.75	27	0.48
Clements	3.23	436	0.69
Davis-Gary	2.95	228	0.58
Dunn	2.94	884	0.65
Eppright	2.99	448	0.64
Fountain	2.64	46	0.58
Fowler	2.90	438	0.63
Gainer	2.56	22	0.73
Haas	2.99	501	0.66
Harrell	2.81	40	0.53
Harrington	2.51	39	0.50
Hart	2.93	508	0.62
Hobby	3.12	437	0.60
Hughes	3.10	177	0.55
Hullabaloo	3.16	634	0.61
Keathley	2.70	464	0.72
Kiest	2.78	67	0.59
Krueger	2.97	866	0.65
Lacy	2.66	13	0.69
Lechner	3.47	399	0.55
Legett	3.03	285	0.58
Leonard	2.56	18	0.63
McFadden	3.42	449	0.55
Moses	2.74	422	0.66
Mosher	2.84	1,243	0.74
Neeley	3.08	499	0.59
Rudder	3.06	457	0.61
Schuhmacher	2.82	288	0.62
Spence	2.84	171	0.51
Underwood	3.13	570	0.60
Utay	2.89	28	0.68
Walton	2.74	509	0.66
Wells	3.14	446	0.57
White	2.43	42	0.47
Whiteley	2.56	32	0.62
Gardens	3.10	557	0.55
Total	**3.00**	**14,173**	**0.66**

The hall type with the highest GPA across all enrollment levels was modular style halls (*M*=3.13, *SD*=0.64) followed by apartment style residences (*M*=3.10, *SD*=0.54), as shown in Table 14. The modular style halls are Appelt, Clements, Eppright, Haas, Hobby, Lechner, McFadden, Neeley, Rudder, Underwood, and Wells halls. The apartment style residences are Gardens and White Creek apartments. The lowest performing hall styles were corridor (*SD*=0.52) with a mean GPA of 2.93 and balcony (*SD*=0.67) and ramp (*SD*=0.65) style halls both having a mean GPA of 2.84.

Table 14 GPA of all Enrollment Levels by Hall Type

Hall Type	Mean	N	SD
Corridor	2.93	5,071	0.52
Commons	2.94	3,917	0.68
Balcony	2.84	1,367	0.67
Modular	3.13	5,200	0.64
Ramp	2.84	1,017	0.65
Apartment	3.10	540	0.55
Total	**2.99**	**17,112**	**0.62**

Similar to the entire sample, as seen in Table 15, the hall type with the highest GPA for U1 on-campus students was modular style halls (*M*=3.13, *SD*=0.64) followed by apartment style residences (*M*=3.10, *SD*=0.54). Also similar to the entire sample, the lowest performing styles were corridor (*SD*=0.61) with a mean GPA of 2.93 and balcony (*SD*=0.67) and ramp (*SD*=0.65) style halls both having a mean GPA of 2.84.

Table 15 GPA of U1 On-Campus Students by Hall Type

Hall Type	Mean	N	SD
Corridor	2.82	1,468	0.61
Commons	2.94	3,917	0.68
Balcony	2.84	1,367	0.67
Modular	3.13	5,200	0.62
Ramp	2.84	1,017	0.65
Apartment	3.10	540	0.55
Total	**2.99**	**13,509**	**0.66**

Students in the sample who live on-campus and were placed in a permanent housing placement at the beginning of the semester had a mean GPA of 2.99 (*SD*=0.62). Students who were put in a temporary placement and later moved had a mean GPA of 2.61 (*SD*=0.69) (see Table 16).

Table 16 GPA of all Enrollment Levels by Permanent or Temporary Status

Perm/Temp	Mean	N	SD
Permanent	2.99	17,098	0.62
Temporary	2.61	14	0.69
Total	**2.99**	**17,112**	**0.62**

U1, on-campus, students who were placed in a permanent housing placement at the beginning of the semester had a mean GPA of 2.99 (*SD*=0.66) (see Table 17). Students who were put in a temporary placement and later moved had a mean GPA of 2.61 (*SD*=0.69).

Table 17 GPA of U1 On-Campus Students by Permanent or Temporary Status

Perm/Temp	Mean	N	SD
Permanent	2.99	13,495	0.66
Temporary	2.61	14	0.69
Total	**2.99**	**13,509**	**0.66**

The highest performing colleges shown in the entire sample and presented in Table 18 were the Bush School of Government and Public Service (*M*=3.60, *SD*=0.49), the Medical School (*M*=3.52, *SD*=0.57), Texas A&M Galveston (*M*=3.33, *SD*=0.62), and the College of Architecture (*M*=3.28, *SD*=0.46), the College of Education and Human Development (*M*=3.28, *SD*=0.53), and Mays Business School (*M*=3.28, *SD*=0.48) which all showed the same mean GPA. The lowest performing colleges shown in the entire sample were Transition Academic Programs (*M*=2.83, *SD*=0.70), unknown college (*M*=2.87, *SD*=0.61), the College of Agriculture and Life Sciences (*M*=3.00, *SD*=0.60), and the College of Liberal Arts (*M*=3.08, *SD*=0.57).

Table 18 GPA of all Enrollment Levels by College

College	Mean	N	SD
Agriculture and Life Sciences	3.00	13,122	0.60
Architecture	3.28	3,169	0.46
Mays Business School	3.28	9,978	0.48
Education and Human Development	3.28	11,055	0.53
Engineering	3.20	20,224	0.57
Geosciences	3.15	1,823	0.58
Bush School of Government and Public Service	3.60	731	0.49
Liberal Arts	3.08	14,089	0.57
Nursing	3.19	6,233	0.63
Veterinary Medicine and Biomedical Sciences	3.19	4,230	0.58
Transition Academic Programs	2.83	4,654	0.70
Unknown	2.87	1,654	0.61
Galveston	3.33	15	0.62
Interdisciplinary	3.13	540	0.64
Medical School	3.52	8	0.57
Total	**3.15**	**91,525**	**0.58**

The highest performing colleges shown by U1, on-campus, students (see Table 19) were the Bush School of Government and Public Service (*M*=3.61, *SD*=0.24), Mays Business School (*M*=3.28, *SD*=0.52), the College of Architecture (*M*=3.16, *SD*=0.47), the College of Education and Human Development (*M*=3.09, *SD*=0.56), and the College of Engineering (*M*=3.03, *SD*=0.68). The lowest performing colleges shown by U1, on-campus, students were unknown college (*M*=2.69, *SD*=0.71), the Medical School (*M*=2.86, *SD*=0.65), the College of Geosciences (*M*=2.88, *SD*=0.54), and Texas A&M Galveston (*M*=2.91, *SD*=0.63).

Table 19 GPA of U1 On-Campus Students by College

College	Mean	N	SD
Agriculture and Life Sciences	2.94	1,310	0.66
Architecture	3.16	353	0.47
Mays Business School	3.28	1,345	0.52
Education and Human Development	3.09	1,250	0.56
Engineering	3.03	3,232	0.68
Geosciences	2.88	234	0.54
Bush School of Government and Public Service	3.61	3	0.24
Liberal Arts	3.02	2,019	0.61
Nursing	NA	NA	NA
Veterinary Medicine and Biomedical Sciences	2.92	1,343	0.72
Transition Academic Programs	3.01	985	0.69
Unknown	2.69	1,251	0.71
Galveston	2.91	586	0.63
Interdisciplinary	NA	NA	NA
Medical School	2.86	61	0.65
Total	**3.00**	**13,972**	**0.66**

Of the entire sample of Texas A&M University students, those that only lived on-campus for one semester showed a higher GPA of 3.18 (*SD*=0.57) compared to those that lived on campus both semesters of an academic year (*M*=2.99, *SD*=0.62) (see Table 20).

Table 20 GPA of all Enrollment Levels by Total Semesters On-Campus

Semesters On-Campus	Mean	N	SD
0	3.18	75,055	0.57
1	3.00	498	0.65
2	2.99	17,699	0.63
Total	**3.15**	**93,252**	**0.58**

Of U1, on-campus students, whether they stayed on-campus for one or two semesters made no difference to academic success. Students who stayed for one semester and students who stayed for two semesters both showed a mean GPA of 3.00 (*SD*=0.68 for one semester, *SD*=0.66 for two semesters) (see Table 21).

Table 21 GPA of U1 On-Campus Students by Total Semesters On-Campus

Semesters On-Campus	Mean	N	SD
1	3.00	67	0.68
2	3.00	14,105	0.66
Total	**3.00**	**14,172**	**0.66**

Tables 22 and 23 seek to share findings related to both of the study's primary research questions. Using step-wise linear regression on the entire dataset at all enrollment levels, five of all the included variables aid in explaining spring GPA. These were the variables of enrollment level, race, campus, gender, and college. Together, these variables explained 10.8% of cumulative GPA variance. Table 22 presents the regression analysis of all Texas A&M University students across all enrollment levels.

Table 22 Regression Explaining GPA across All Enrollment Levels

	B	SE	Beta	t	Sig.
(Constant)	3.121	0.212		14.731	0.000
Enrollment Level	0.149	0.010	0.233	14.426	0.000
Race	-0.053	0.002	-0.174	-23.725	0.000
Campus	-0.113	0.015	-0.076	-7.367	0.000
Gender	-0.094	0.010	-0.074	-9.524	0.000
College	-0.007	0.001	-0.043	-5.670	0.000

Since enrollment level explains a sizable amount of GPA, another stepwise linear regression was run on only on-campus students at a U1 enrollment level. Including all variables as possible explainers of variance for GPA, hours, race, college, gender, and hall type emerged as meaningful to explain spring GPA.A total of 31.1% of the variance was explained by the five variables of credit hours, race, college, gender and hall type. Credit hours provided the most explanatory power of GPA performance with over 28%. Thus, making it the most significant variable unearthed by the study. Race explained 2% of the variance in GPA performance while college, gender, and hall type each accounting for less than one percent of the variance in student

spring GPA performance. Table 23 presents the R Squared values for the stepwise linear regression for on-campus U1 students.

Table 23 Regression Explaining GPA for On-Campus U1

	B	SE	Beta	t	Sig.
(Constant)	1.714	0.050		33.984	0.000
Hours	0.041	0.001	0.499	43.262	0.000
Race	-0.051	0.004	-0.142	-12.339	0.000
College	-0.011	0.002	-0.061	-5.328	0.000
Gender	-0.074	0.016	-0.052	-4.549	0.000
Hall Type	0.022	0.006	0.040	3.529	0.000

CHAPTER V

CONCLUSION, IMPLICATIONS, & RECOMMENDATIONS

Summary of the Study

This study sought to examine the influence of housing and residential environment variables on academic success. Existing historical data, including both demographic variables and housing variables, were paired into two full cohorts. These two cohorts were run through stepwise linear regression analysis to determine the effects of variables on academic success. Enrollment level, race, campus, gender, and college described 10.8% of GPA differences among the entire dataset of Texas A&M University students and credit hours, race, college, gender, and hall type explained 31.1% of GPA differences among U1 students living on-campus. Therefore, housing variables are relevant in the discussion of student success.

Conclusions

Even though there is not enough of the percentage of variance explained to develop a predictive model for GPA, there may still be practical significance for housing professionals shown in the findings. The most significant housing variable on GPA performance is campus (on, off, Corps of Cadets) followed by hall type for on-campus students at Texas A&M University. Residency described 1.4% of the entire population's GPA performance and hall type described 0.2% of U1 student academic success. Suggesting two possible additions to the literature for further investigation.

In addition to the findings of the regression analysis, there are practical findings found in the GPA breakdown by each of the study variables. The residence halls with the highest GPAs in both the total sample and for U1 students only was Lechner and McFadden halls, both of which

house the University Honors Housing Community. The role of hall placement in the success of these high-achieving students can be further studied to assess the community aspect of the LLC and Lechner and McFadden halls. Additionally, the lowest performing halls are either Corps of Cadet housing or the halls with the lowest rental rates on-campus (e.g Moses, FHK, and Schuhmacher). This suggests the possible negative influence of participation in the Corps of Cadets on academic performance and halls where socioeconomic status may be a compounding variable in the examination of student success on-campus.

The hall types that reported the highest GPA for both the entire sample and U1 on-campus students were modular and apartment style halls. The apartments are unique in that they house a higher percentage of U2, U3, U4, and graduate students than the rest of the university residences. The high GPA reported by U1 students in the apartments indicates an otherwise missed variable in these students' academic success. This confirms the findings from the stepwise linear regression which assert that enrollment level and credit hours explain the most variance in GPA performance. Additionally, the success of modular halls could be attributed to the Engineering LLC.

The lower GPA performance of students who are placed in temporary housing could be attributed to the stress of beginning a semester without permanent housing. The lower GPAs of these students is interesting as the decision of temporary placement at the beginning of the fall semester is made randomly but these students still report a lower mean GPA.

Discussions, Implications, and Recommendations

The impact of campus and hall type appearing in the list of significant variables demonstrates that housing and residential variables contributes to academic success. This

finding, though not statistically significant in our study, shows a promising incentive for more research into the impact of housing and residential variables on residential college students. To further expand on this study, more demographic and housing variables may be included in future research to adequately explain student GPA. Some of these potential variables include first generation student status, campus involvement, and self-perception of student success. Future studies can expand upon our work by utilizing more housing variables, like the examples listed above, as well as a more complete dataset.

Based off of the findings of this study, the DRL could work toward more hall-wide academic LLCs since this has shown to be effective in keeping student GPA high through the Engineering LLC and the Honors Housing Community. Secondly, preventative measures such as targeted academic outreach and marketing could be implemented in halls that house the Corps of Cadets and that fall on the lower end of the price scale to better serve students of lower socioeconomic status. A greater focus in the DRL could be centered on keeping students out of temporary housing or ensuring that they are moved to a permanent placement before the first class date.

Overall, this study shows that variables of housing and residential life play a part in a student's academic success. While the findings of this study were not statistically significant, they are a step forward in the study of the impact that of housing variables make in the lives of students. Further study and a larger dataset could prove helpful in creating a predictive equation connecting housing and GPA in the future.

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APPENDIX

Letter of Departmental Support

DIVISION OF STUDENT AFFAIRS

Department of Residence Life
Central Administrative Office

TEXAS A&M UNIVERSITY

February 13, 2017

Division of Research
Research Compliance and Biosafety – Institutional Review Board
750 Agronomy Road, Suite 2701
TAMU 1186
College Station, TX 77843-1186

Dear Institutional Review Board Members:

The Department of Residence Life aims to support students in their persistence and matriculation to degree by providing safe, comfortable, and an academically supportive environment on campus. With over 11,000 students living on campus, it is important to holistically understand the on campus residential experience. To this end, we are excited to partner on this research project.

Dr. Lori Moore, Mr. Dustin Grabsch and members of the research team are interested in conducting a study of using up to five years of historical student data within our housing database(s). This may amount between 50,000 – 80,000 historical database entries.

As the Department's director, I support the study of our current and former residents' responses within our housing database, using demographic data from our housing database, and other non-personally identifiable data from our department related to the resident, pending IRB approval. I will continue to approve this research as long as the IRB remains active. Findings of this study could help us better meet the needs of our current and future students. I look forward to reviewing the findings of this study.

Sincerely,

Chareny Rydl

Chareny Rydl
Director of Residence Life

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