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**ORIGINAL RESEARCH**

# THE RELATIONSHIP OF DEMOGRAPHIC AND ADMISSION EXAM SCORES WITH FIRST SEMESTER GRADE POINT AVERAGE IN TWO COHORTS OF FIRST YEAR NURSING STUDENTS

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**Abstract**

**Background:** As nursing programs in Indonesia admit students, it is important that student factors are identified that provide information about necessary resources that are needed to support the student, both academically and psychosocially, to succeed in the nursing program.

**Obejctive:** The purpose of this study was to use regression analysis to analyze admission and academic data of two cohorts of nursing students to know what relationship that information has with first semester grade point average (GPA).

**Methods:** A descriptive correlation design was used. In a previous study with one cohort of nursing students, the researcher found that the variables accounted for only 28% of the variance. This research added the variable of age, increased the categories for region of origin from five to seven, increased the categories for type of high school from three to four, and analyzed the data from two cohorts. Data from 947 students were included for analysis. Mulivariate linear regression was used to analyze the variables of city of origin, attendance at pre-nursing course, gender, age, type of high school, and admission exam scores to determine the relationship, if any, between the first semester GPA of nursing students in a large university in an urban area of Indonesia.

**Results:** A significant relationship ($p<.05$) was found between experience factors, attribute factors, and academic metric factors and first semester GPA. For students admitted in 2016, the study variables accounted for 30% of the variance in GPA; for students admitted in 2017, the study variables accounted for 37% of the variance in GPA.

**Conclusion:** It is important that student factors are identified that provide information about succeeding in the nursing program, both academically and psychosocially. Additional research is needed to identify other admission factors and any factors in the first semester that may also have a relationship with GPA.

KEYWORDS
holistic admission model; GPA; nursing education

## INTRODUCTION

There is a growing movement in healthcare education, including nursing, to have a holistic review admission process to develop a more diverse healthcare workforce (Scott & Zerwic, 2015). The goal of a diverse workforce in healthcare is to improve health, especially in underserved communities (Glazer et al., 2016). Holistic admission is a flexible, individualized way of assessing a potential student's capabilities to contribute value to a healthcare profession (American Association of Medical Colleges, 2013). Balanced consideration is given to examining factors of experience, attributes, and education metrics of the potential student (American Association of Medical Colleges, 2013). It is

important to ensure that students admitted will be able to complete the degree and provide safe quality patient care (Urban Universities for Health, 2014). To do so requires that faculty have the available resources that are necessary for the student's success (Glazer et al., 2016; Scott & Zerwic, 2015). It is important that nursing programs adequately prepare graduates to meet the demands for nursing, both in quantity and quality.

To facilitate student success in a nursing program, it is important that student factors are identified that provide information about necessary resources needed to support the student, both academically and psychosocially. In a previous study of one cohort of first year nursing students (Sommers & Park, 2017), the researcher noted that the study variables accounted for only 28% of the variance in grade point average (GPA). The researcher recommended that additional research be done with additional variables and with more than one cohort of first year nursing students. This current research added the variable of age, increased the categories in city of origin from five to seven, and increased the categories in type of high school from three to four. It also included two cohorts of first year nursing students.

The purpose of this study was to examine the association, if any, of experience factors (city of origin and attendance at pre-nursing course), attribute factors (gender and age), and academic metric factors (admission scores and type of high school) with the first semester GPA of first year nursing students from two cohorts of first year nursing students enrolled in a baccalaureate nursing program in Indonesia. The two cohorts were students admitted during August 2016 and those admitted during August 2017. First semester GPA was chosen as a determinant of success as it has been associated with successful completion of a nursing program (Newton & Moore, 2009). GPA is also a strong predictor of graduation (American Council on Education, 2016).

**Theoretical framework**

Scott and Zerwic (Scott & Zerwic, 2015) adapted the Association of American Medical Colleges (American Association of Medical Colleges, 2013) model of holistic admission for use in nursing. The model includes factors of experiences (i.e. experiences in life, communities, and healthcare; leadership opportunities; and culture/diversity), attributes (i.e. demographic characteristics, abilities, maturity, interests, and goals), and academic metrics (i.e. education background, GPA, standardized tests, and pre-admission test scores). Implementation of the model resulted in more diverse students being admitted.

As holistic admission is implemented in nursing programs, it will be important that academic success is monitored (Glazer et al., 2016). However, in nursing there is a lack of data on which factors of the student will best predict future success in nursing (Glazer et al., 2016). This study used a variation of the

Scott and Zerwic (Scott & Zerwic, 2015) model of holistic admission for use in nursing as shown in **Figure 1**.
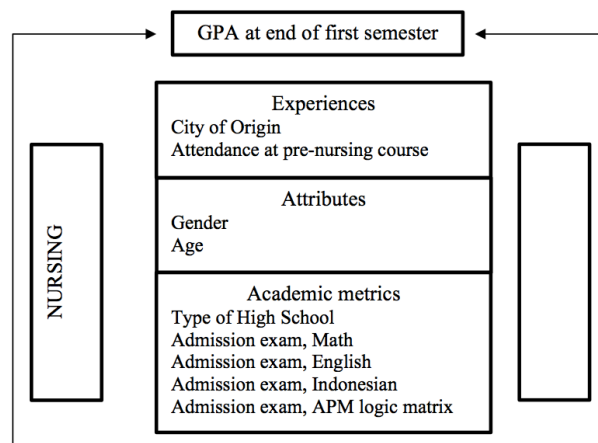


**Figure 1** Adapted Holistic Admission Model

The variables of interest for this study was first semester grade point average (GPA), the experience factors of city of origin and attendance at pre-nursing course, the attribute factors of gender and age, and the academic metrics of type of high school attended and admission exam scores. Previous researchers have found a relationship between GPA in the first semester and completion of a nursing study program (Newton & Moore, 2009). The reliability of first semester GPA with other courses has been determined as .84 and is therefore a reliable indicator to measure the academic performance of students (Bacon & Bean, 2006).

The variables of city of origin and attendance at pre-nursing course were chosen as experience factors for this study. The island where the city of origin is located was divided into seven regions (see Table 1). The variable attendance at pre-nursing course was defined as attendance at a special, invitation-only extra-curricular course that is offered prior to the first semester. This course provides intense instruction in life skills, basic computer and math skills, and introduction to English. Previous researchers have found a weak association with region of origin/ethnicity and GPA in nursing students in New Zealand (Shulruf, Wang, Zhao, & Baker, 2011).

The variables of gender and age were chosen as attribute factors for this study. Gender was defined by the World Health Organization (World Health Organization, 2011) as socially constructed characteristics of women and men. Age was defined as the total number in years of the student on 1 August of the year the student was admitted to the nursing program. The author found in the previous study of one cohort of students that gender was associated with GPA (Sommers & Park, 2017). It is not known if there is any relationship with age and GPA.

Academic metrics included type of high school and admission exam scores in math, English, Indonesian, and a logic. The type of high school was defined as the classification of the high school program the student attended and was divided into four

categories (See **Table 1**). The author found in the previous study of one cohort of students that type of high school was associated with GPA (Sommers & Park, 2017). The exams for math, English, and Indonesian were developed by faculty at the university that taught those subjects. No reliability and validity studies have been conducted. The range of the math exam is 0-30 and tests basic math concepts. The range of the English exam is 0-50 and tests English reading ability and grammar. The range of the Indonesian exam is 0-40 and tests Indonesian reading ability and grammar. The logic exam is the language-free version of Raven's Advanced Progressive Matrices (APM) licensed by the University of Indonesia. The reliability of the exam for studies done in the United States was .85 (NCS Pearson Inc, 2011), indicating good reliability (Polit & Beck, 2017). Previous researchers have found an association with admission exam scores and GPA of first year nursing students (Shulruf et al., 2011; Underwood, Williams, Lee, & Brunnert, 2013).

## METHODS

### Study design and sample
This study was conducted at a large private baccalaureate nursing program in Lippo Karawaci, Indonesia between October 2017 to January 2018. A descriptive correlation design was used. A convenience sample of all students admitted to the nursing program in August 2016 and August 2017 was used. A data set was used that included admission and academic records of nursing students that were accepted in August 2016 and August 2017. A pilot study was not done. There were 510 nursing students admitted in August 2016 and 443 nursing students admitted in August 2017. Data related to demographic variables, admission exam scores, and first semester GPA was collected between August 2016-December 2016 and August-December 2017, respectively, to assist in providing and assessing details regarding the characteristics of the admission cohort and to evaluate the transition of the new students to FoN. This information is compiled every academic year as part of routine academic administration procedures. Each cohort was examined for relationship between GPA and study variables. The two cohorts were also combined and examined for a relationship between GPA and study variables.

### Ethical consideration
Approval for the study was given from Mochtar Riady Institute for Nanotechnology Ethics Committee, Protocol Number: 04.1709180. After ethical approval was obtained, a de-identified data set was created from the academic records of the two cohorts that contained only the dependent variable of first semester GPA and the independent variables of city of origin, attendance at pre-nursing course, gender, age type of high school, math admission exam score, English admission exam score, Indonesian admission exam score, and Raven's Advanced Progressive Matrices (APM) logic matrix exam score. The privacy of students was protected as all data was de-identified in the database and there was not any student identifying information. All data in the de-identified database

was kept confidential and stored on secured servers that were only accessed from password protected computers.

### Data analysis
Data were analyzed in SPSS using regression analysis to determine what relationship, if any, the experience, attribute, and academic metrics have with first semester GPA in nursing students from two cohorts that were admitted in August 2016 and August 2017. Data from each cohort was analyzed separately and then also combined. The level of significance was set at .05. Descriptive statistical analysis was used to describe the characteristics of the data and included means and standard deviations for continuous variables and frequency distributions and percentages for categorical variables. Multivariate linear regression was used to determine the relationships between the variables and the first semester GPA.

Prior to conducting the regression, the data were explored for missing data, unusual values, outliers, and whether the data meets the assumptions of linearity, normality, non-multicollinearity, homoscedasticity, and independence. Four of the students in Cohort 2016 had missing data for GPA and two of the students in Cohort 2017 had missing data for GPA. There was no data about the GPA because the students did not complete the first semester. Since the missing data is small (less than 1%), listwise deletion was used, and it is acknowledged that there was a small potential for bias by doing so (Parent, 2013). After listwise deletion, the remaining data for each cohort (Cohort 2016 N = 506; Cohort 2017 N = 441) and combined cohorts (N = 947) was examined for linearity was examined by evaluating the partial plots for the independent variables and the correlations between the independent variables and the first semester GPA. This assumption was met as the partial plot had a linear relationship with all the data points near the line. None of the independent variables had a high correlation with the dependent variable of GPA. Testing for normality was done by examining the residual histogram for each cohort and for the combined data, which had an approximate normal curve. Testing for multicollinearity was done by evaluating the bivariate correlation matrix, tolerance value, variance inflation factors value, condition indices, and standardized residual values. There was no evidence of multicollinearity as the bivariate correlation matrix values are all below .50, the tolerance values were above .10, and the variance index factor values were below 10 (Kutner, Nachtsheim, & Neter, 2004). The condition indices were also below 30. Homoscedasticity was evaluated by reviewing the scatter plot and no clear pattern was seen. Independence was tested by evaluating the value for Durban Watson, which was 1.78 (Cohort 2016), 1.9 (Cohort 2017), and 2.04 (Combined) respectively which is within the recommend values of 1.5 to 2.5 (Lester, Inmna, & Bishop, 2014).

## RESULTS

Characteristics of the final samples are displayed in **Table 1**. The mean GPA of Cohort 2016 was 3.03 (*SD* = 0.25), Cohort 2017 was 3.19 (*SD* = 0.25), and combined was 3.10 (*SD* = 0.2).

Most of the participants in cohort 2016 were from the island of Sumatra ($n$ = 161, 31.8%) and did not attend the pre-nursing course ($n$ = 394, 77.9%). Most of the participants in cohort 2017 were from the island of Java ($n$ = 137, 31.1%), followed closely by the island of Sumatra ($n$ = 136, 30.8%), and did not attend the pre-nursing course ($n$ = 362, 82.1%). In Cohort 2016, there were 401 females (79.2%) and 105 males (20.8%); In Cohort 2017 there were 358 females (81.2%) and 83 males

(19.8%). The means of the admission exams for Cohort 2016 were: math 10.17 ($SD$ = 3.91), English 19.93 ($SD$ = 5.36), Indonesian 17.23 ($SD$ = 3.60), and APM 21.55 ($SD$ = 3.55). The means of the admission exams for Cohort 2017 were: math 10.70 ($SD$ = 3.17), English 23.18 ($SD$ = 6.88), Indonesian 24.01 ($SD$ = 3.52), and APM 21.86 ($SD$ = 3.69). For both groups, most participants attended a health/science focused high school (Cohort 2016, $n$ = 402, 79.4%; Cohort 2017, $n$ = 335, 76.0%).

**Table 1** Characteristics of the sample

| Variable Mean (SD) | Cohort 2016 (N=506) | Cohort 2017 (N=441) | Combined (N=947) |
|---|---|---|---|
| **Age** | 17.82 (0.78) | 17.76 (0.79) | 17.79 (0.78) |
| **Admission Exam Scores (possible range)** | | | |
| Math admission exam score (0-30) | 10.17 (3.91) | 10.70 (3.17) | 10.42 (3.60) |
| English admission exam score (0-50) | 19.93 (5.36) | 23.18 (6.88) | 21.44 (6.33) |
| Indonesian admission exam score (0-40) | 17.23 (3.60) | 24.01 (3.52) | 20.38 (4.91) |
| *APM admission exam score (0-36) | 21.55 (3.55) | 21.86 (3.69) | 21.69 (3.62) |
| **\*GPA (0.00-4.00)** | 3.03 (0.25) | 3.19 (0.26) | 3.10 (0.27) |
| **Region of Origin $n$ (%)[a]** | | | |
| Sumatra Island (reference group) | 161 (31.8) | 136 (30.8) | 297 (31.4) |
| Java Island | 106 (20.9) | 137 (31.1) | 243 (25.7) |
| Kalimantan Island | 41 (8.1) | 20 (4.5) | 61 (6.4) |
| Sulawesi Island | 94 (18.6) | 49 (11.1) | 143 (15.1) |
| Papua Island | 28 (5.5) | 33 (7.5) | 61 (6.4) |
| Maluku Islands | 37 (7.3) | 30 (6.8) | 61 (7.1) |
| Bali and Nusa Tenggar Islands | 39 (7.7) | 36 (8.2) | 75 (7.9) |
| **Attendance at pre-nursing course** | | | |
| No (reference group) | 394 (77.9) | 362 (82.1) | 756 (79.8) |
| Yes | 112 (22.1) | 79 (17.9) | 191 (20.2) |
| **Gender** | | | |
| Female (reference group) | 401 (79.2) | 358 (81.2) | 759 (80.1) |
| Male | 105 (20.8) | 83 (18.8) | 188 (19.9) |
| **Type of High School [b]** | | | |
| Health/Science High School (reference group) | 402 (79.4) | 335 (76.0) | 737 (77.8) |
| Social Science High School | 40 (7.9) | 33 (7.5) | 73 (7.7) |
| Health/Science Vocational School | 42 (8.3) | 48 (10.9) | 90 (9.5) |
| Social Science Vocational School | 22 (4.3) | 25 (5.7) | 47 (5.0) |

[a]5 regions used in previous study: Sumatra island, Java and Bali islands, Sulawesi island, Kalimantan island, Eastern islands
[b]3 types of high school used in previous study: Science high school, Health/science vocational school, Social science vocational or high school
*APM = Raven's Advanced Progressive Matrices
*GPA = Grade Point Average

Blockwise multivariate linear regression was done to determine the relationship between GPA and independent variables. In a previous study using Cohort 2016 (Sommers & Park, 2017) a two-block model with two steps: (1) attribute and experience factors of gender, region of origin, and attendance at pre-nursing course and (2) academic metric factors of admission exam scores and type of high school had an identical end model summary as a three-block model with three steps: (1) attribute factors of gender, (2) experience factors of region of origin and attendance at pre-nursing course, and (3) academic metric factors of admission exam scores and type of high school As

the end model summary was the same, the study used a two-block model. In the current study, the two-block model with two steps (1) attribute and experience factors of age, region of origin, and attendance at pre-nursing course and (2) academic metric factors of admission exam scores and type of high school also had an identical end summary compared to a three-block model for Cohort 2016, Cohort 2017 and the Combined sample. Thus, the two-block model which included both attribute and experience factors in the first block, was chosen and reported in this study (see **Table 2**).

**Table 2** Two-block multivariate linear regression model of variables

**Cohort 2016 Two-block Model Summary**

| Step | R | $R^2$ | Adjusted $R^2$ | $R^2$ Change | F Change | df1 | df2 | Significant F Change | Durbin-Watson |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.26 | 0.07 | 0.05 | 0.07 | 3.94 | 9.00 | 496.00 | 0.00 | |
| 2 | 0.54 | 0.30 | 0.27 | 0.23 | 22.80 | 7.00 | 489.00 | 0.00 | 1.78 |

**Cohort 2017 Two-block Model Summary**

| Step | R | $R^2$ | Adjusted $R^2$ | $R^2$ Change | F Change | df1 | df2 | Significant F Change | Durbin-Watson |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.22 | 0.05 | 0.03 | 0.05 | 2.43 | 9.00 | 431.00 | 0.01 | |
| 2 | 0.60 | 0.37 | 0.34 | 0.32 | 30.23 | 7.00 | 424.00 | 0.00 | 1.89 |

**Combined Two-block Model Summary**

| Step | R | $R^2$ | Adjusted $R^2$ | $R^2$ Change | F Change | df1 | df2 | Significant F Change | Durbin-Watson |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.21 | 0.05 | 0.04 | 0.05 | 4.93 | 9.00 | 937.00 | 0.00 | |
| 2 | 0.61 | 0.38 | 0.37 | 0.33 | 70.61 | 7.00 | 930.00 | 0.00 | 2.04 |

Step 1 variables: gender, region of origin, attendance at pre-nursing course
Step 2 variables: admission exam scores, type of high school

For Cohort 2016, the multiple correlation coefficient *R* was .54 for the final model. As the possible range for *R* is 0 to 1, an *R* of .54 indicates a moderate association between the independent variables and GPA ([Polit & Beck, 2017](#)). The $R^2$ was .30, indicating that about 30% of the variance in GPA is accounted for by all the independent variables in this study, while only 5% of the variance was explained by attribute and experience factors. The $R^2$ improved by .23 by adding the academic metric factor variables of admission exam scores and type of high school to the model. This linear combination of independent variables was significantly associated with GPA, $F(7, 489) = 22.80$, $p < .001$.

For Cohort 2017, the multiple correlation coefficient *R* was .60 for the final model. As the possible range for *R* is 0 to 1, an *R* of .60 indicates a moderate association between the independent variables and GPA (Polit & Beck, 2017). The $R^2$ was .37, indicating that about 37% of the variance in GPA is accounted for by all the independent variables in this study, while only 3% of the variance was explained by attribute and experience factors. The $R^2$ improved by .32 by adding the academic metric factor variables of admission exam scores and type of high school to the model. This linear combination of independent variables was significantly associated with GPA, $F(7, 424) = 30.23$, $p < .001$.

The multiple correlation coefficient *R* in the combined sample was .51 for the final model, indicating a moderate association between the independent variables and GPA ([Polit & Beck, 2017](#)). The $R^2$ was .38, indicating that about 38% of the variance in GPA is accounted for by all the independent variables in this study, while only 4% of the variance was explained by attribute and experience factors. The $R^2$ improved by .37 by adding the academic metric factor variables of admission exam scores and type of high school to the model.

This linear combination of independent variables was significantly associated with GPA, $F(7, 930) = 40.61$, $p < .001$.

Based on analysis of the beta coefficients, several independent variables were associated with GPA (see Table 3, regression table). For Cohort 2016, when individual variables using standardized beta scores were examined, the score on the English admission exam ($B = .01$, $p < .001$, $\beta = .26$) explained the most variance in GPA, followed by the score on the Indonesian admission exam ($B = .01$, $p < .001$, $\beta = .21$), type of high school, social science focused high school when compared to health/science focused high school ($B = -.14$, $p < .001$, $\beta = -.15$), score on the APM admission exam ($B = .01$, $p = .001$, $\beta = .13$), gender, male when compared to female ($B = -.07$, $p = .004$, $\beta = -.11$), score on the math admission exam ($B = .01$, $p = .017$, $\beta = .10$), and region of origin, Papua island when compared to Sumatra island ($B = -.10$, $p = .032$, $\beta = -.09$). There was no significant relationship between attendance at the pre-nursing course ($B = -.01$, $p = .763$, $\beta = -.01$) or age ($B = -.02$, $p = .252$, $\beta = -.05$) and GPA.

For Cohort 2017, when individual variables using standardized beta scores were examined, the score on the English admission exam ($B = .01$, $p < .001$, $\beta = .28$) also explained the most variance in GPA, followed by the score on the Indonesian admission exam ($B = .02$, $p < .001$, $\beta = .26$), score on the math admission exam ($B = .02$, $p < .001$, $\beta = .22$), score on the APM admission exam ($B = .01$, $p = .001$, $\beta = .16$), attendance at pre-nursing course ($B = .09$, $p = .003$, $\beta = .13$), and type of high school, social science focused vocational school when compared to health/science focused high school ($B = -.11$, $p = .022$, $\beta = -.09$). There was no significant relationship between gender, male when compared to female ($B = .02$, $p = .523$, $\beta = .03$), age ($B = -.01$, $p = .388$, $\beta = -.04$), and any region of origin with GPA.

**Table 3** Independent variables associated with GPA

| Variable | B | SE B | 95% CI for B | | t | Sig. | β |
|---|---|---|---|---|---|---|---|
| | | | Lower | Upper | | | |
| **Age** | | | | | | | |
| Cohort 2016 | -.02 | .01 | -.04 | .01 | -1.15 | .252 | -.05 |
| Cohort 2017 | -.01 | .01 | -.04 | .02 | -0.86 | .388 | -.04 |
| Combined | -.01 | .01 | -.03 | .01 | -1.39 | .164 | -.04 |
| **Gender** | | | | | | | |
| Cohort 2016 | -.07 | .02 | -.12 | -.02 | -2.93 | .004 | -.11 |
| Cohort 2017 | .02 | .03 | -.04 | .07 | 0.64 | .523 | .03 |
| Combined | -.03 | .02 | -.06 | .01 | -1.59 | .113 | -.04 |
| **Attendance at Pre-nursing course** | | | | | | | |
| Cohort 2016 | -.01 | .03 | -.06 | .04 | -0.30 | .763 | -.01 |
| Cohort 2017 | .09 | .03 | .03 | .15 | 2.95 | .003 | .13 |
| Combined | .04 | .02 | .00 | .07 | 1.91 | .057 | .05 |
| **Java Island (Dummy variable)** | | | | | | | |
| Cohort 2016 | -.05 | .03 | -.11 | .00 | -1.82 | .069 | -.08 |
| Cohort 2017 | .01 | .03 | -.05 | .06 | 0.27 | .787 | .01 |
| Combined | -.02 | .02 | -.06 | .02 | -1.17 | .244 | -.04 |
| **Kalimantan Island (Dummy variable)** | | | | | | | |
| Cohort 2016 | -.01 | 0.04 | -.09 | .06 | -0.34 | .732 | -.01 |
| Cohort 2017 | .06 | .05 | -.04 | .16 | 1.17 | .242 | .05 |
| Combined | .02 | .03 | -.04 | .08 | 0.58 | .563 | .02 |
| **Sulawesi Island (Dummy variable)** | | | | | | | |
| Cohort 2016 | -.04 | .03 | -.09 | .02 | -1.35 | .176 | -.06 |
| Cohort 2017 | .06 | .04 | -.01 | .14 | 1.71 | .089 | .08 |
| Combined | .00 | .02 | -.04 | .05 | 0.07 | .941 | .00 |
| **Papua Island (Dummy variable)** | | | | | | | |
| Cohort 2016 | -.10 | .04 | -.18 | -.01 | -2.16 | .032 | -.09 |
| Cohort 2017 | -.08 | .04 | -.17 | .01 | -1.85 | .064 | -.08 |
| Combined | -.08 | .03 | -.14 | -.02 | -2.55 | .011 | -.07 |
| **Maluku Islands (Dummy variable)** | | | | | | | |
| Cohort 2016 | -.02 | .04 | -.09 | .06 | -0.43 | .670 | -.02 |
| Cohort 2017 | .02 | .05 | -.07 | .11 | 0.40 | .690 | .02 |
| Combined | .00 | .03 | -.06 | .06 | 0.09 | .931 | .00 |
| **Bali and Nusa Tenggar Islands (Dummy variable)** | | | | | | | |
| Cohort 2016 | .00 | .04 | -.07 | .08 | 0.04 | .967 | .00 |
| Cohort 2017 | .00 | .04 | -.08 | .08 | 0.05 | .962 | .00 |
| Combined | .01 | .03 | -.04 | .07 | 0.44 | .662 | .01 |
| **English Admission Exam Score** | | | | | | | |
| Cohort 2016 | .04 | .00 | .01 | .02 | 5.65 | .000 | .26 |
| Cohort 2017 | .01 | .00 | .01 | .01 | 6.11 | .000 | .28 |
| Combined | .01 | .00 | .01 | .01 | 8.81 | .000 | .27 |
| **Math Admission Exam Score** | | | | | | | |
| Cohort 2016 | .01 | .00 | .00 | .01 | 2.10 | .017 | .11 |
| Cohort 2017 | .02 | .00 | .01 | .03 | 5.25 | .000 | .22 |
| Combined | .01 | .00 | .01 | .02 | 5.05 | .000 | .15 |
| **Indonesian Admission Exam Score** | | | | | | | |
| Cohort 2016 | .01 | .00 | .01 | .02 | 4.91 | .000 | .21 |
| Cohort 2017 | .02 | .00 | .01 | .03 | 6.25 | .000 | .26 |
| Combined | .02 | .00 | .01 | .02 | 11.09 | .000 | .32 |
| **APM Admission Exam Score** | | | | | | | |
| Cohort 2016 | .01 | .00 | .00 | .01 | 3.27 | .001 | .03 |
| Cohort 2017 | .01 | .00 | .01 | .02 | 3.78 | .000 | .16 |
| Combined | .01 | .00 | .01 | .01 | 4.78 | .000 | .13 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Social Science High School (Dummy variable)** | | | | | | | |
| Cohort 2016 | -.14 | .04 | -.21 | -.07 | -3.80 | .000 | -.15 |
| Cohort 2017 | -.06 | .04 | -.13 | .03 | -1.35 | .178 | -.05 |
| Combined | -.10 | .03 | -.16 | -.05 | -3.79 | .000 | .10 |
| **Health/Science Vocational School (Dummy variable)** | | | | | | | |
| Cohort 2016 | -.01 | .04 | -.08 | .06 | -0.39 | .700 | -.02 |
| Cohort 2017 | .04 | .04 | -.03 | .11 | 1.07 | .283 | .05 |
| Combined | .01 | .03 | -.04 | .06 | 0.41 | .685 | .01 |
| **Social Science Vocational School (Dummy variable)** | | | | | | | |
| Cohort 2016 | -.02 | .05 | -.11 | .07 | -0.45 | .653 | -.02 |
| Cohort 2017 | -.11 | .05 | -.20 | -.02 | -2.30 | .022 | -.09 |
| Combined | -.07 | .03 | -.14 | -.01 | -2.12 | .034 | -.06 |

Note. CI = Confidence Interval; Sig. = t test significance

When individual variables using standardized beta scores were examined for the combined sample, the score on the Indonesian admission exam ($B = .02$, $p < .001$, $\beta = .32$) explained the most variance in GPA, followed by the score on the English admission exam ($B = .01$, $p < .001$, $\beta = .27$), score on the math admission exam ($B = .01$, $p < .001$, $\beta = .15$), score on the APM admission exam ($B = .01$, $p < .001$, $\beta = .13$), type of high school, social science focused high school when compared to health/science focused high school ($B = -.10$, $p < .001$, $\beta = -.10$), region of origin, Papua island when compared to Sumatra island ($B = -.08$, $p = .011$, $\beta = .07$), and type of high school, social science focused vocational school when compared to health/science focused high school ($B = -.07$, $p = .034$, $\beta = -.06$). There was no significant relationship between attendance at pre-nursing course ($B = .04$, $p = .057$, $\beta = .05$), gender, male when compared to female ($B = -.03$, $p = .113$, $\beta = -.04$), and age ($B = -.01$, $p = .164$, $\beta = -.04$) with GPA.

Controlling for all the other variables in Cohort 2016, when each of the English, Indonesian, APM, and math admission exam score was increased by one point, the GPA increased by .01 (English $p < .001$, 95% CI [0.01, 0.02]; Indonesian $p < .001$, 95% CI [0.01, 0.02]; APM $p = .001$, 95% CI [0.00, 0.01]; math $p = .017$, 95% CI [0.00. 0.01]). If the student attended a social science focused high school, the GPA was decreased by .14 ($p < .001$, 95% CI [-0.21, -0.07] compared to students that attended a health/science focused high school. Male students had a .07 ($p = .002$, 95% CI [-0.12, -0.03]) lower GPA compared to female students. Students from Papua Island had a .10 ($p = .032$, 95% CI [-0.18, -0.01]) lower GPA than students from Sumatra Island.

Controlling for all the other variables in Cohort 2017, when the English and APM admission exam score was increased by one point, the GPA increased by .01 (English $p < .001$, 95% CI [0.01, 0.01]; APM $p < .001$, 95% CI [0.01, 0.02]). When the Indonesian and math admission exam score was increased by one point, the GPA increased by .02 (Indonesian $p < .001$, 95% CI [0.01, 0.03]; math $p < .001$, 95% CI [0.01. 0.03]). If the student attended the pre-nursing course, the GPA was increased by .09 ($p = .003$, 95% CI [0.03, 0.15]). If the student attended a social science focused vocational school, the GPA was

decreased by .11 ($p = .022$, 95% CI [-0.20, -0.02]) compared to students that attended a health/science focused high school.

For the combined sample, when controlling for all the other variables, when each of the English, APM, and math admission exam score was increased by one point, the GPA increased by .01 (English $p < .001$, 95% CI [0.01, 0.01]; APM $p < .001$, 95% CI [0.01, 0.01]; math $p < .001$, 95% CI [0.01. 0.02]). When the Indonesian admission exam score was increased by one point, the GPA increased by .02 ($p < .001$, 95% CI [0.01, 0.02]. If the student attended a social science focused high school, the GPA was decreased by .10 ($p < .001$, 95% CI [-0.16, -0.05]) and if attended a social science focused vocational school, the GPA decreased by .07 ($p = .034$, 95% CI [-0.14, -0.01]) compared to students that attended a health/science focused high school. Students from Papua Island had a .08 ($p = .011$, 95% CI [-0.14, -0.02]) lower GPA than students from Sumatra Island.

The zero-order, partial, and part correlation coefficients were examined to determine if any of the independent variables had a suppression effect. For some of the variables in each sample, the sign of the zero-order correlation and B coefficient were opposite, which suggests the possibility of some suppression in the model. However, as there is not a decrease in $R^2$ with their inclusion in the model in each of the samples, the possible suppression effect is minimal.

## DISCUSSIONS

This study examined what experience factors (region of origin and attendance at pre-nursing course), attribute factors (gender and age), and academic metric factors (admission exam scores and type of high school) are associated with the first semester GPA of first year nursing students enrolled in a baccalaureate nursing program in Indonesia. These variables accounted for 30% (Cohort 2016), 37% (Cohort 2017), and 38% (Combined) in the variance of first semester GPA. This is a slight improvement from the model that was used in a previous study with Cohort 2016 where the variables accounted for only 28% of the variance (Sommers & Park, 2017). A significant relationship ($p < .05$) was found between admission exam

scores and type of high school with first semester GPA in students admitted in 2016 and 2017 and in the combined sample. In addition, for Cohort 2016, a significant relationship ($p < .05$) was also found between gender and region of origin and first semester GPA. For Cohort 2017, there was also a significant relationship ($p < .05$) found between attendance at pre-nursing and first semester GPA. The combined sample also had a significant relationship ($p < .05$) between region of origin and first semester GPA. None of the groups had a significant relationship between age and first semester GPA.

The findings of a relationship between region of origin and GPA is like previous findings (Shulruf et al., 2011; Sommers & Park, 2017). However, in the previous research, students from the islands of Java and Bali had significantly lower GPAs (Sommers & Park, 2017) and in this research study the students from Papua island had a significantly lower GPA for Cohort 2016 and the combined sample. It may be that by expanding the region of origin categories better explored the region of origin association with GPA. In addition, other explanations for the relationship, rather than just the island of origin (i.e. other variables that influence the experience factor such as culture, leadership roles, etc. may assist in explaining that relationship.

Similar to the results of this study, previous studies have also found a relationship between admission exam scores and GPA in first year students (Shulruf et al., 2011; Sommers & Park, 2017; Underwood et al., 2013). The findings in this study of a relationship between gender and GPA in first year students was not found in previous studies (Shulruf et al., 2011); however, it was only found in students admitted in 2016, but not 2017. In the current study, students that did not attend a health/science focused vocational or high school had a lower GPA at the end of the first semester.

As in the previous study (Sommers & Park, 2017), the admission exam scores for English and Indonesian had the most influence on first semester GPA for all three samples. For students admitted in 2016, they were enrolled in a General English course the first semester and those that scored higher on the admission English exam may also have achieved a higher grade in the General English course, resulting in a higher GPA; however, for students admitted in 2017, they did not have any language courses the first semester. It may be that those that scored higher on the language admission exams have a better reading and writing ability that influenced their general performance in all courses, resulting in a higher GPA.

There are several limitations to this study. There is the potential for bias, as the six students that were excluded because of missing data, did not complete the first semester. These six students may have different characteristics from the rest of the samples. A threat to internal validity is that there may have been factors that occurred during the first semester (i.e. tutoring, student ability to transition, personal habits, etc.) that were not controlled, and these may have also influenced the first semester GPA.

This study adds to the body of knowledge related to the holistic admission model. Factors of experience, attributes, and academic metrics were found to have an association with first semester GPA. The variables in this study only accounted for 30% (Cohort 2016), 37% (Cohort 2017), and 38% (Combined) of the variance in the first semester GPA. Other factors of experience, attributes, and academic metrics are influencing the first semester GPA that were not included as variables in this study. More research is needed to determine what other variables are associated with first semester GPA in first year nursing students (i.e. interview results, psychology testing results, support during the semester, study habits, etc.). The variables may be a combination of admission factors (i.e. experience, attributes, and academic metrics as described by the holistic admission model) and factors that occur during the first semester (i.e. tutoring, transition to university, study habits). Other researchers have suggested that factors such as stress, self-efficacy, satisfaction, and motivation in nursing students may have a relationship with student success (Jeffreys, 2015). Further research is needed to identify and study these variables.

All of the admission exam scores had a positive relationship with GPA. Students that attended a social science vocational or high school had a negative relationship with GPA, with a decrease in GPA of around 0.1 lower than students from a science high school. The Indonesian government requires that students graduate from nursing school with a GPA of 2.75, a change of around 0.1 in the GPA has a meaningful significance, as students who have a GPA of 2.74 cannot complete the nursing program. The other findings of gender (Cohort 2016), attendance at pre-nursing course (Cohort 2017), and region of origin (Cohort 2017) may not have meaningful implications in identifying students at possible high-risk for a GPA less than 2.75, as the findings were not consistent with both groups of admitted students. Identifying high risk students early and implementing support interventions early may assist the students to improve their GPA and successfully complete the nursing program. Possible support interventions could include academic counseling, study skill workshops, writing resources, and support groups. Other research has recommended a focus on improving the success of all students, not just high-risk students, to develop a variety of support interventions and increase completion rates in a nursing program (Jeffreys, 2015). This could involve having different levels of language courses, based on the student's ability when entering the nursing program. Additional research is needed regarding the relationship of student support interventions and other factors that occur during the first semester, if any, have on GPA.

**Declaration of Conflicting Interests**
There are no conflicts of interest to declare.

**Author Contributions**
Both authors made significant contributions to the conception, design, execution, data acquisition, or analysis/interpretation of the study and have approved the final version of the manuscript and have agreed to its submission for publication.

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