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Overall, there were very few differences in the outcomes of interest between the LLC groups. Students in an Other LLC had somewhat higher high school GPAs than those in an SNS LLC or No LLC; however, this difference was very small and may not be practically meaningful. There were also trends indicating that students in an SNS LLC earned one credit more on average than Other LLC and No LLC students at the end of their first and second terms at UC Merced. However, statistical tests could not be performed, and all LLC groups met the normal progress policy based on average credits earned such that this trend may not be meaningful.

First gen students in an SNS LLC had lower values than non-first gen students in an SNS LLC on high school GPA, and UCM first-term GPA; however, these differences were not statistically significant. There was no difference between groups on UCM first term credits attempted or earned. First gen students in an SNS LLC attempted and earned fewer UCM second term credits than non-first gen students in an SNS LLC. However, statistical tests could not be performed, and all groups met the normal progress policy based on average credits earned such that this trend may not be meaningful. First gen students in an SNS LLC had a higher 1-year retention rate than non-first gen students in an SNS LLC, but again, the difference was not significant.

Off-campus students in No LLC had a higher average high school GPA than on-campus students in No LLC, but the difference was not significant. Off-campus students in No LLC had a significantly lower UCM first-term end of term GPA, but this difference disappeared for UCM second term end of term GPA. Off-campus students in No LLC earned fewer first and second term credits than on-campus students in No LLC. However, statistical tests could not be performed, and all groups met the normal progress policy based on average credits earned such that this trend may not be meaningful. Off-campus students in No LLC had a lower 1-year retention rate than on-campus students in No LLC, but this difference was not significant.

## Background

The requesters were interested in investigating differences between three Living Learning Community (LLC) groups: students in an LLC in the School of Natural Sciences (SNS LLC), students in a non-SNS LLC (Other LLC), and students not in an LLC (No LLC) during their first term at UC Merced. Per the request, we used an Analysis of Variance (ANOVA) to investigate whether there were differences across these LLC groups<sup>1</sup> on the following outcomes<sup>2</sup>: average high school GPA, average first and second term UC Merced end of term GPA, and average first and second term UC Merced end of term earned credits<sup>3</sup>. A chi-squared analysis was used to investigate differences in 1-year retention rate across the LLC groups<sup>4</sup>. Differences in these outcomes were also investigated for first gen and non-first gen students in an SNS LLC and off-campus and on-campus students in No LLC. T-tests were used to detect differences in average high school GPA, average first and second term UC Merced end of term GPA, and average first and second term UC Merced end of term earned credits. A chi-square analysis was used to investigate differences in 1-year retention rate between groups.

<sup>1</sup> A p value <.05 was considered a statistically significant difference. Effect size is measured by partial eta squared ( $\eta_p^2$ ). A partial eta squared ( $\eta_p^2$ ) of .02 is considered a small effect size. Because statistical significance relies on many factors (e.g., sample size), it is important to consider effect sizes when interpreting statistical significance – results that are statistically significant may not be practically significant/important.

<sup>2</sup> Note that we use the word “outcome” to refer to these variables, but high school GPA is a pre-college factor that was measured prior to LLC participation.

<sup>3</sup> Note the analyses were performed on UC Merced end of second term GPA and credits earned, not cumulative GPA and credits earned at the end of the second term.

<sup>4</sup> A p value <.05 was considered a statistically significant difference.

Important note: Because there are many factors that could account for associations between LLC participation and the outcomes of interest, no causal conclusions can be made regarding whether LLC participation caused changes in these outcomes.

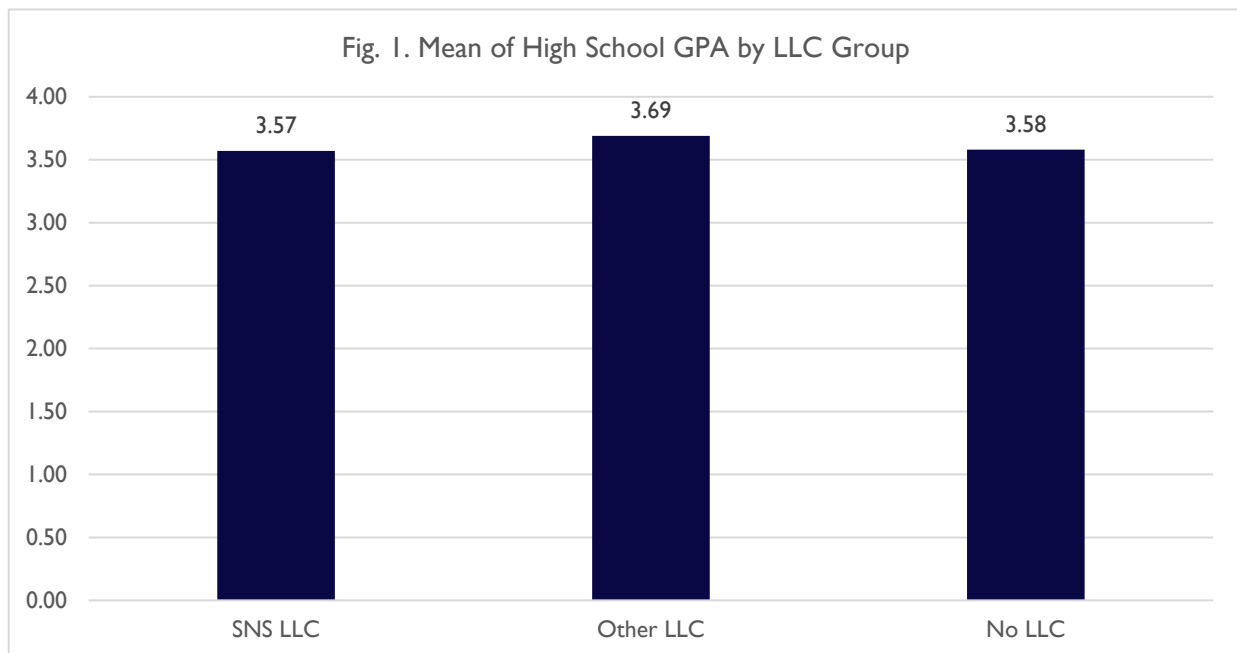
Sample: All incoming frosh in the Fall 2018 and Fall 2019 cohorts. Cohorts were combined to maximize the sample size (see Table 1) for each LLC group and because there were no research questions about cohort differences.

**Table 1: Fall 2018 and Fall 2019 Frosh Cohort by LLC group**

LLC Group	Fall 2018 Cohort	Fall 2019 Cohort	Total
SNS LLC	121	101	222
Other LLC	234	177	411
No LLC	1862	1829	3691
Total	2217	2107	4324

## LLC Groups Outcome 1:

Average high school GPAs did differ between LLC groups, i.e. the students' high school performance differed, but the effect size and differences were very small<sup>5</sup>, meaning the differences were not practically significant. As can be seen in Fig 1, the Other LLC group (M=3.69) had a higher high school GPA than both the SNS LLC (M = 3.57) and No LLC (M = 3.58) groups<sup>6</sup>, which did not differ<sup>7</sup>.



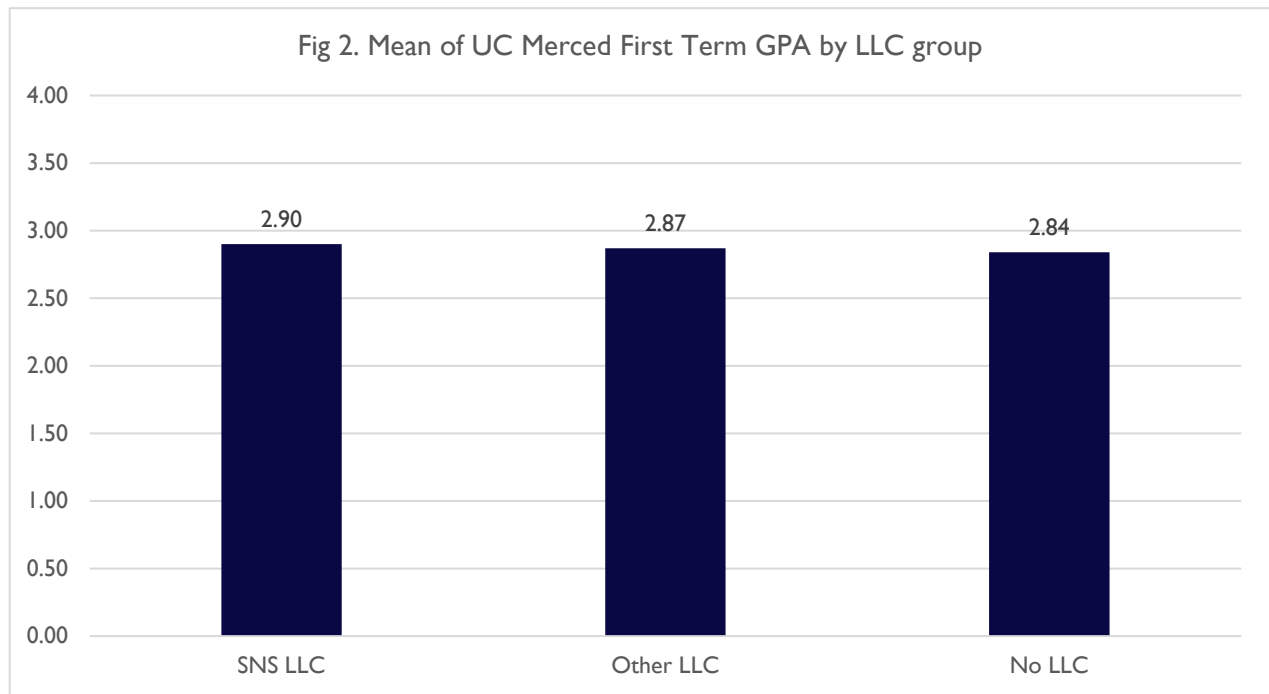
<sup>5</sup>  $F(2, 4321) = 24.12, p < .001, \eta_p^2 = .01.$

<sup>6</sup>  $p$ 's  $< .001$

<sup>7</sup>  $p = .456$

## Outcome 2: UC Merced first term GPAs

As can be seen in Fig 2, there were very slight differences in average UC Merced first term GPAs between the LLC groups; these differences were not statistically significant<sup>8</sup>, i.e. participants in an LLC do not perform any differently academically than students not in an LLC<sup>9</sup>.

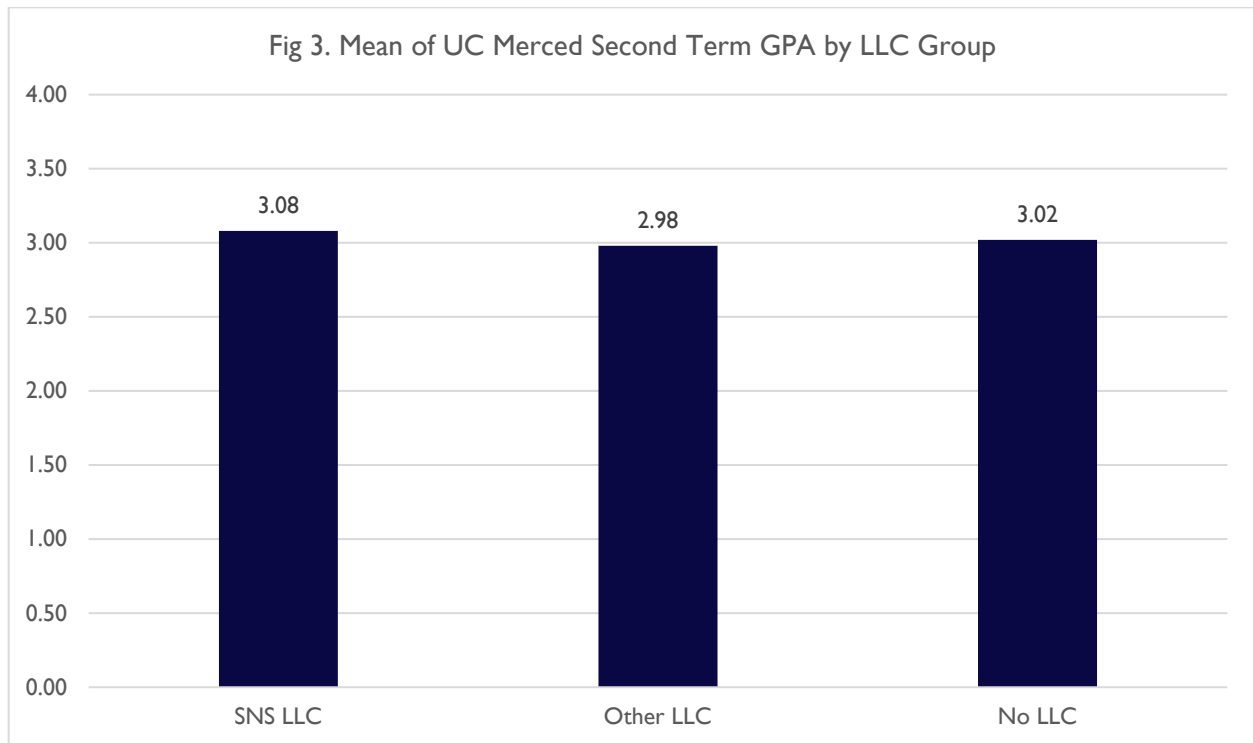


<sup>8</sup>  $F(2, 4216) = .99, p = .374, \eta_p^2 = .00$

<sup>9</sup> Students with a UC Merced first term GPA of 0 ( $n = 102$ ) were excluded from the analysis. Three students who had missing GPAs were also excluded. A GPA of zero is primarily caused by dropping from UC Merced without working with the registrar while those with missing GPA's worked through the registrar. The final analysis included  $n = 4,219$  students.

## Outcome 3: UC Merced Second Term GPAs

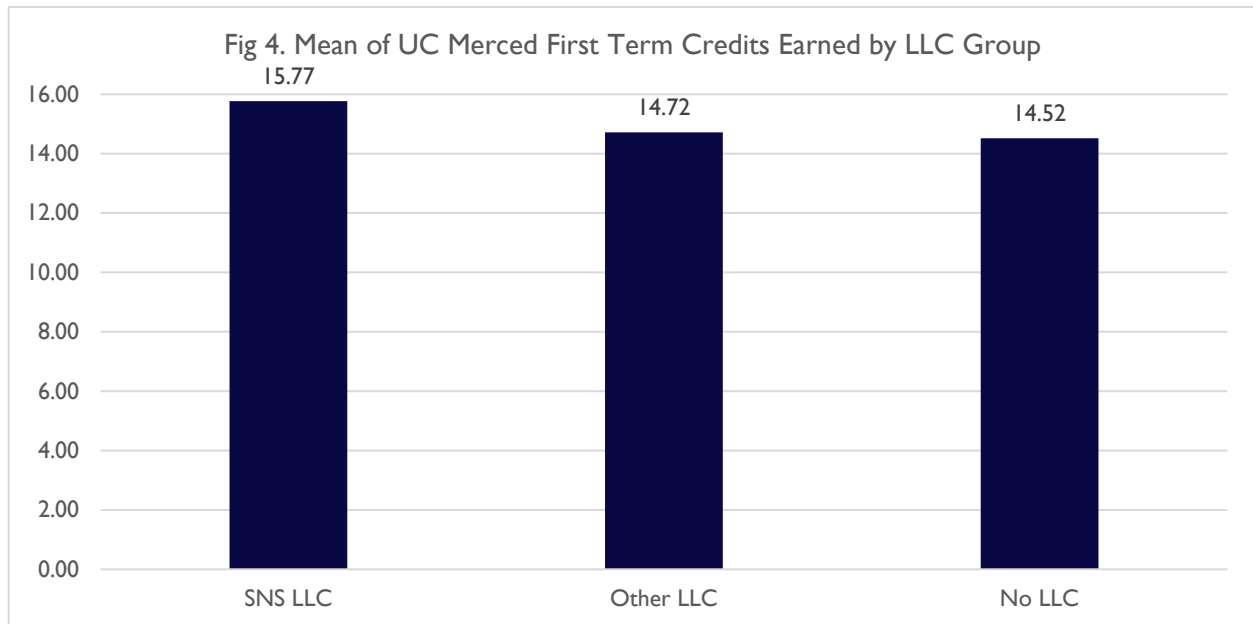
As can be seen in Fig 3, there were very slight differences in average UC Merced second term GPAs between the LLC groups; these differences were not statistically significant<sup>10</sup>. After two semesters in an LLC, LLC students still perform roughly the same academically as non-LLC students. Only students who were retained to the second term were included.



<sup>10</sup>  $F(2, 4216) = .99, p = .374, \eta_p^2 = .00$

## Outcome 4: UC Merced First Term Credits Earned

As can be seen in Fig 4, there was a trend indicating that SNS LLC students earned about one credit more on average at the end of their first term at UC Merced ( $M = 15.77$ ) compared to the Other LLC ( $M = 14.72$ ) and No LLC ( $M = 14.52$ ) groups. However, no statistical test could be performed<sup>11</sup> such that this result should be interpreted with caution. When rounded up, all average end of term credits earned followed UC Merced's normal progress policy, which requires an average of 15 credits per term<sup>12</sup>. It is often the case that the typical number of credits earned per term is highly related to proscribed curricular pathways (e.g., course sequencing recommendations) within particular academic majors.

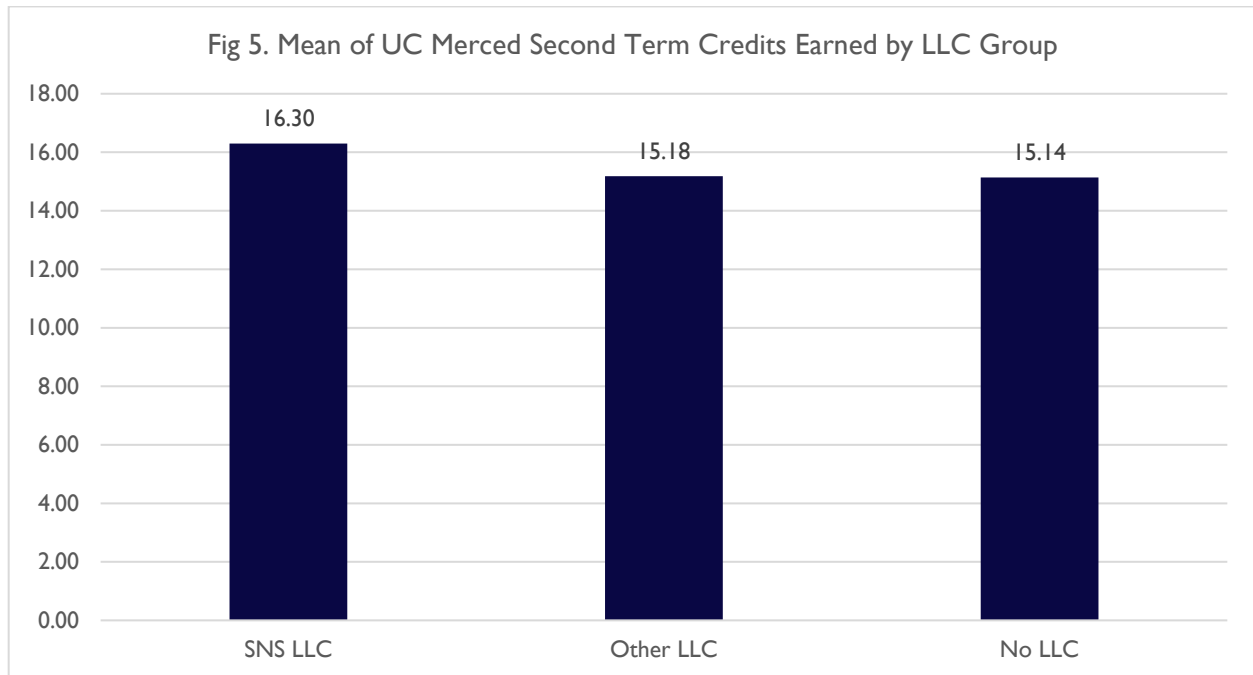


<sup>11</sup> The distribution of the standardized residuals violated the assumptions of the statistical test such that no statistical comparison could be performed. 4,265 students had non-zero UC Merced first term credits; 59 students earned 0 UC Merced first term credits because they dropped all courses without going through the registrar.

<sup>12</sup> <https://engr-advising.ucmerced.edu/policies/normal-progress>

## Outcome 5: UC Merced Second Term Credits Earned

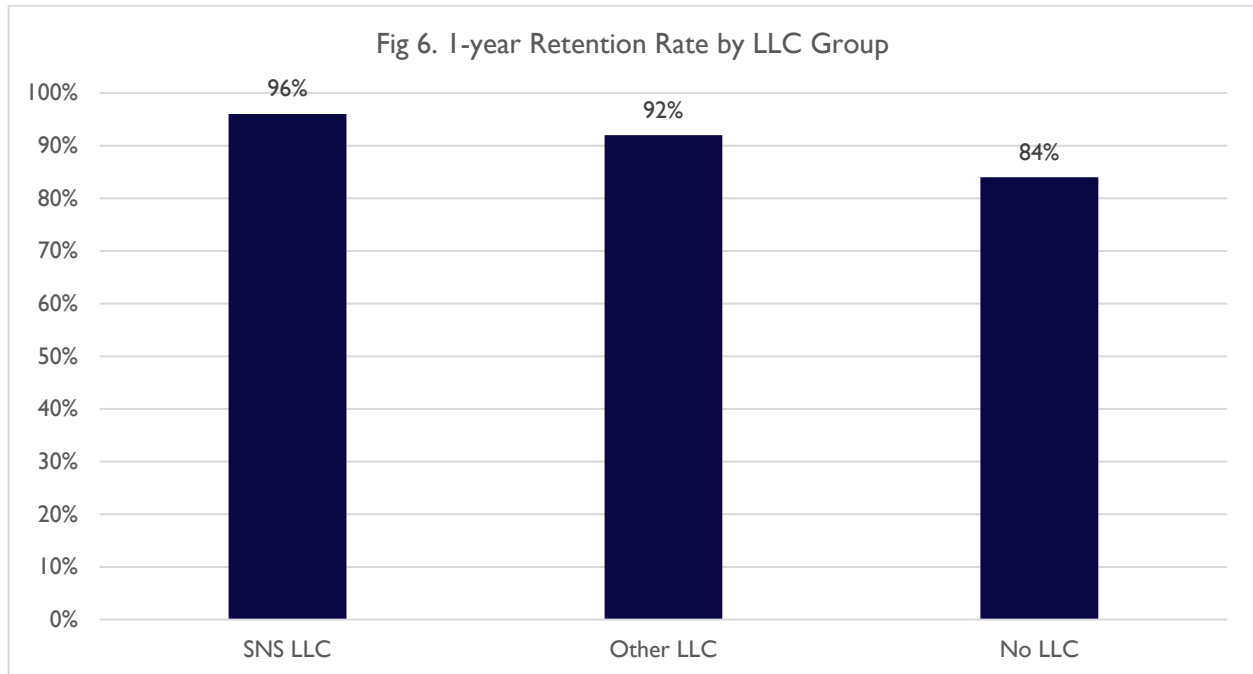
As can be seen in Fig 5, there was a trend such that SNS LLC students earned one credit more on average at the end of their second term at UC Merced ( $M = 16.30$ ) compared to the Other LLC ( $M = 15.18$ ) and No LLC ( $M = 15.14$ ) groups. However, no statistical test could be performed<sup>13</sup> such that this result should be interpreted with caution. Again, when rounded up, all average end of second term credits earned followed UC Merced's normal progress policy, which requires an average of 15 credits per term. Any apparent differences in credits earned at the end of the term could be due to proscribed curricular pathways. Only students who were retained to the second term were included.



<sup>13</sup> The distribution of the standardized residuals violates the assumptions of the statistical test such that no statistical comparison could be performed. 4019 students had non-zero UC Merced second term credits. 27 students earned 0 UC Merced second term credits because they dropped all courses without going through the registrar. 278 students had missing UC Merced second term credits because they were not retained to the second term.

## Outcome 6: 1-Year Retention Rate

As can be seen in Fig 6, students in no LLC had a lower retention rate than students in either LLC group<sup>14</sup>. The differences between the groups were significant. Students in no LLC differed from both LLC groups<sup>15</sup>, but the LLC groups did not differ from each other. Participation in an LLC, whether it's an SNS LLC or an Other LLC, increases retention; however, many factors may influence this association, so the difference cannot be attributed solely or primarily to participation in an LLC.



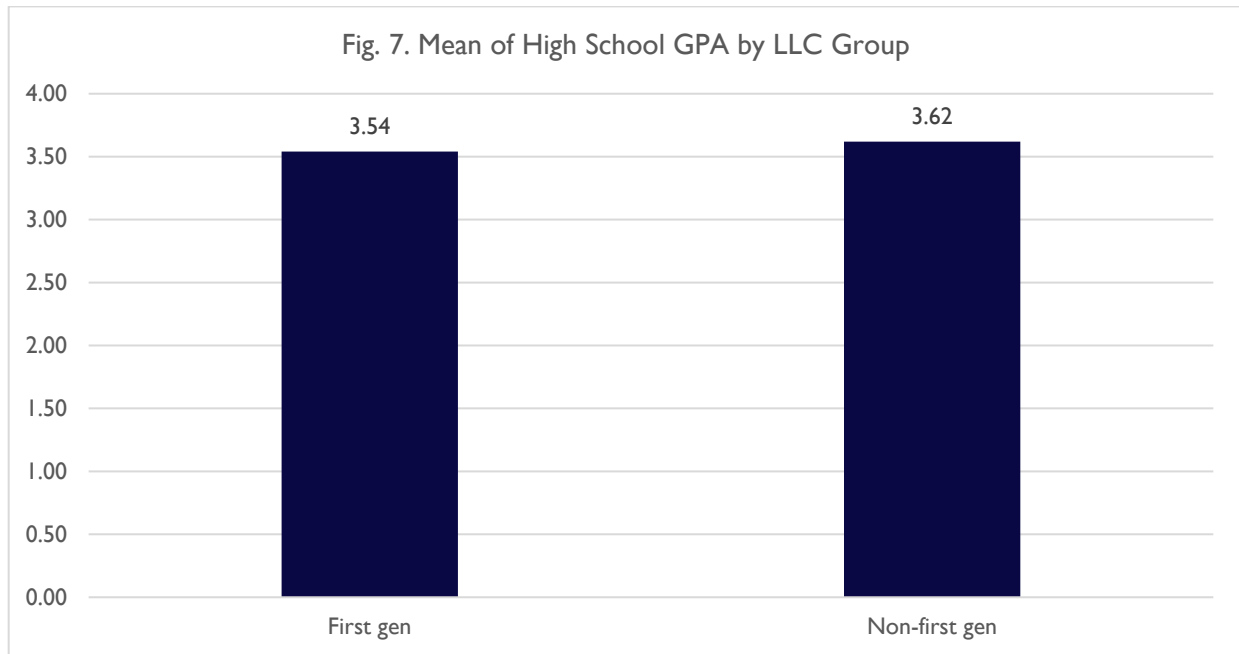
<sup>14</sup> ( $\chi^2(2) = 35.67, p < .001$ )

<sup>15</sup> Bonferroni correction was used to examine differences between column proportions ( $p < .05$ ).

## SNS LLC First Gen Groups

### Outcome I:

Average high school GPAs did differ between first gen groups in an SNS LLC, i.e. the students' high school performance differed, but the difference was not statistically significant<sup>16</sup>. As can be seen in Fig 7, the first gen group (M=3.54) had a lower high school GPA than the non-first gen group (M = 3.62).

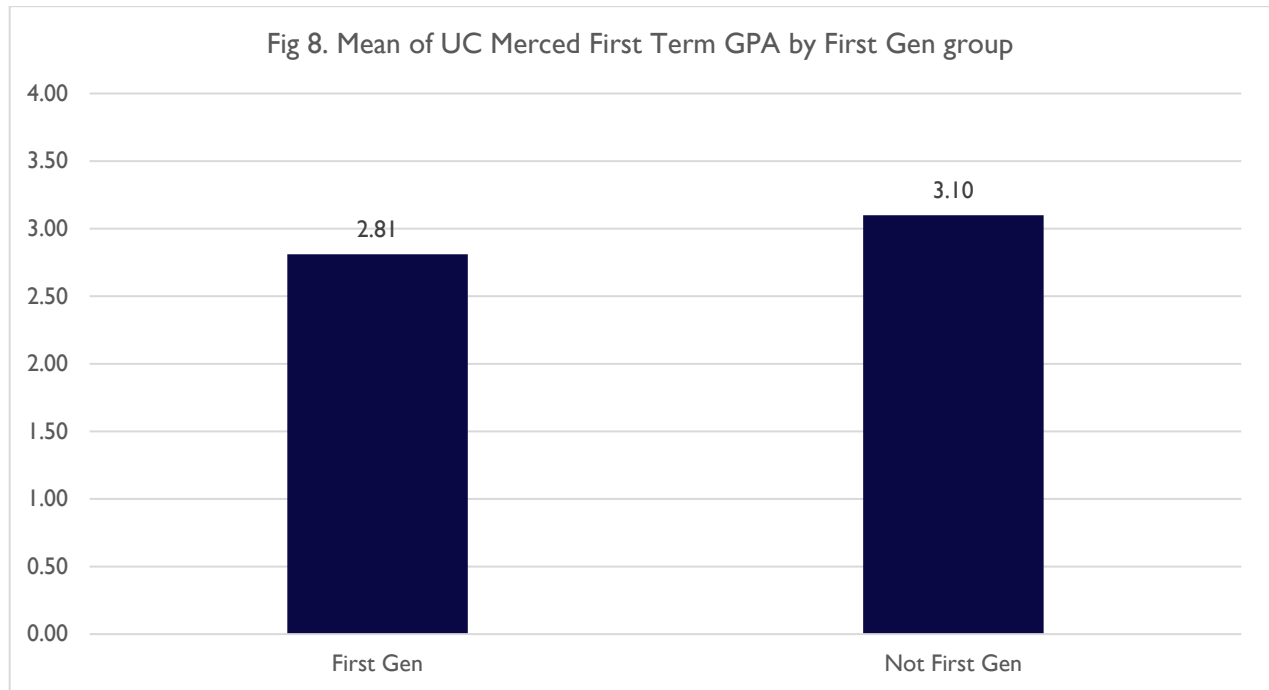


<sup>16</sup> p = .788.



## Outcome 2: UC Merced first term GPAs

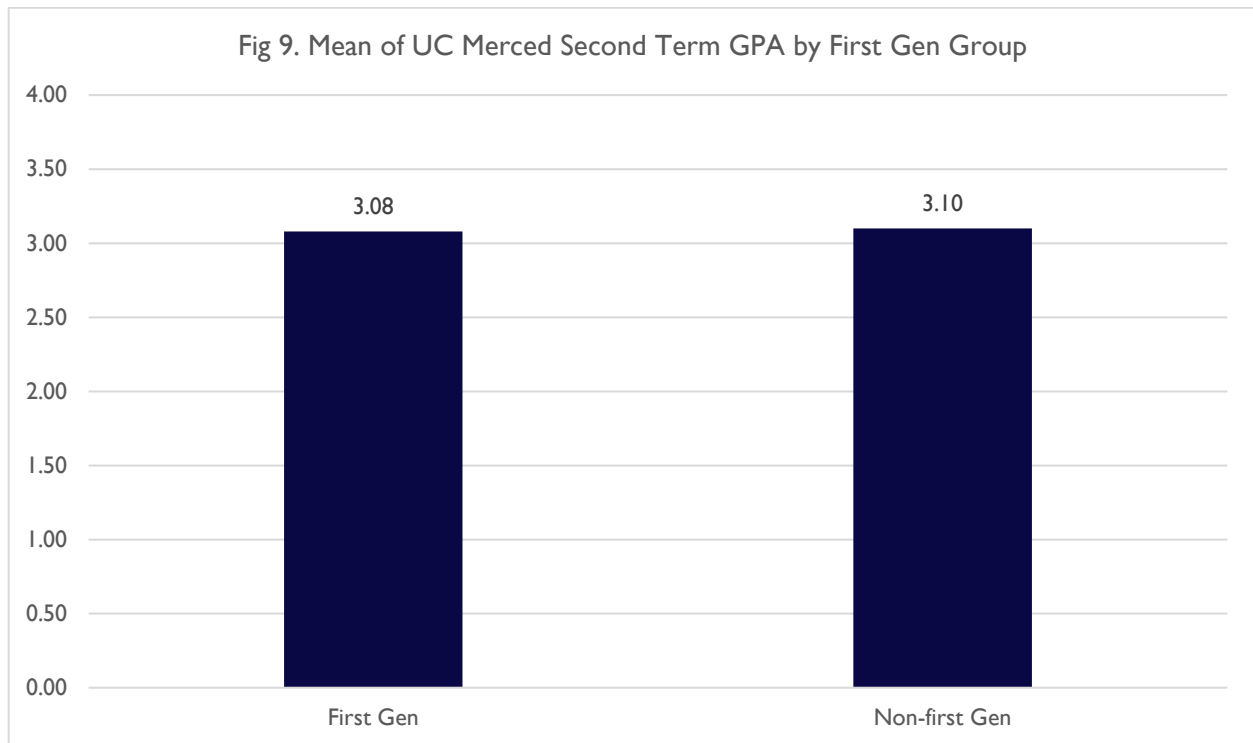
As can be seen in Fig 8, there were differences in average UC Merced first term GPAs between the first gen groups; these differences were not statistically significant<sup>17</sup>, i.e. first gen participants in an SNS LLC do not perform any differently academically than non-first gen students in an SNS LLC.



<sup>17</sup> p=.131

## Outcome 3: UC Merced Second Term GPAs

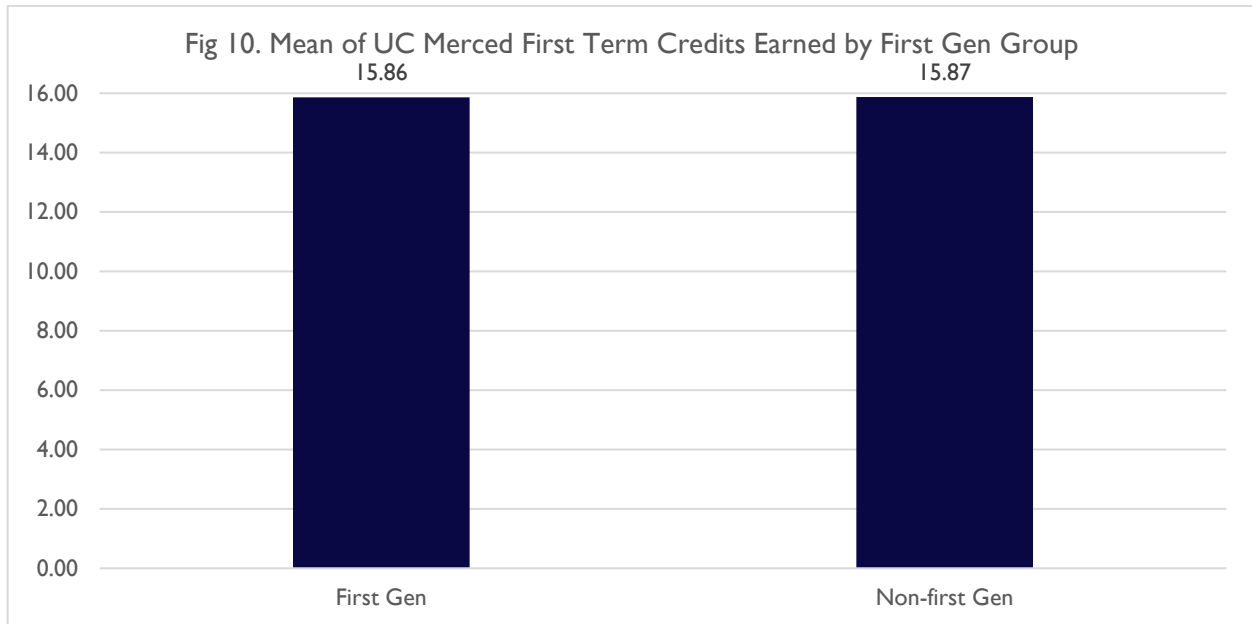
As can be seen in Fig 9, there were very slight differences in average UC Merced second term GPAs between the first gen groups; these differences were not statistically significant<sup>18</sup>. After two first gen students in an SNS LLC still perform roughly the same academically as non-first gen students in an SNS LLC. Only students who were retained to the second term were included.



<sup>18</sup> p = .103

## Outcome 4: UC Merced First Term Credits Earned

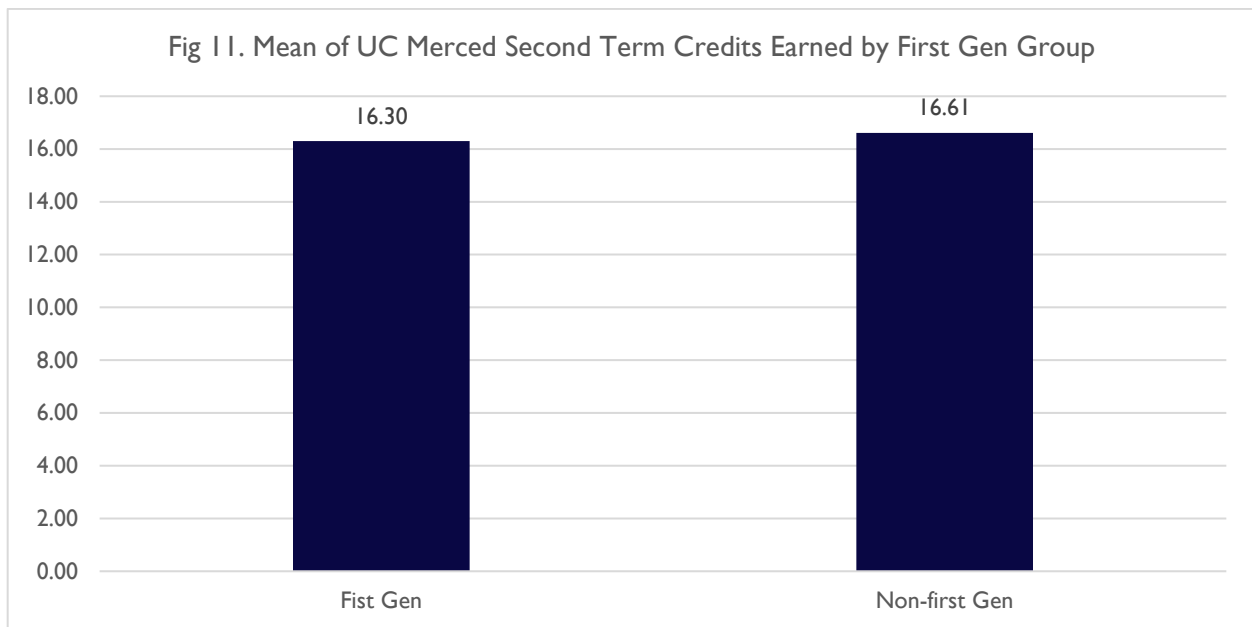
As can be seen in Fig 10, there was no practical difference between UC Merced first semester credits earned by first gen students in an SNS LLC (M=15.86) and non-first gen students in an SNS LLC (M=15.87). However, no statistical test could be performed<sup>19</sup> such that this result should be interpreted with caution.



<sup>19</sup> The distribution violated the assumptions of the statistical test such that no statistical comparison could be performed.

## Outcome 5: UC Merced Second Term Credits Earned

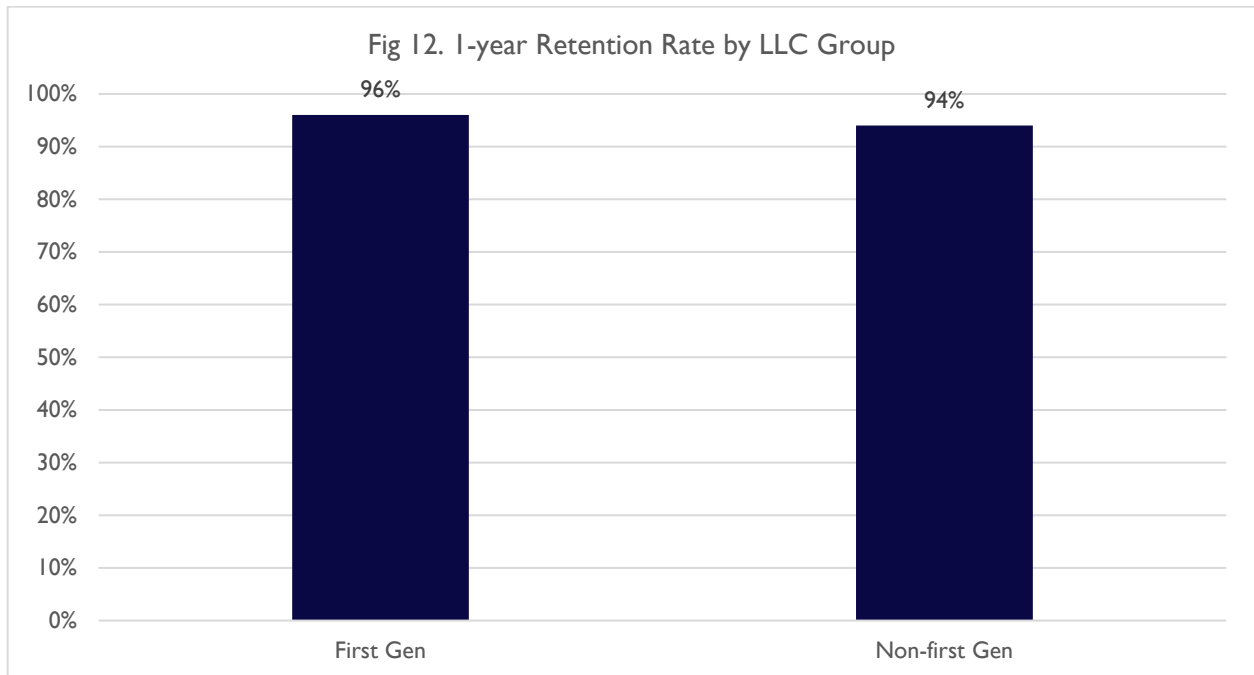
As can be seen in Fig 10, first gen students in an SNS LLC (M=16.30) earned slightly fewer second term credits than non-first gen students in an SNS LLC (16.61); however, many factors can influence this, and the difference cannot be attributed solely or primarily to either SNS LLC participation or first gen status. In addition, no statistical test could be performed<sup>20</sup> such that this result should be interpreted with caution.



<sup>20</sup> The distribution violated the assumptions of the statistical test such that no statistical comparison could be performed.

## Outcome 6: 1-Year Retention Rate

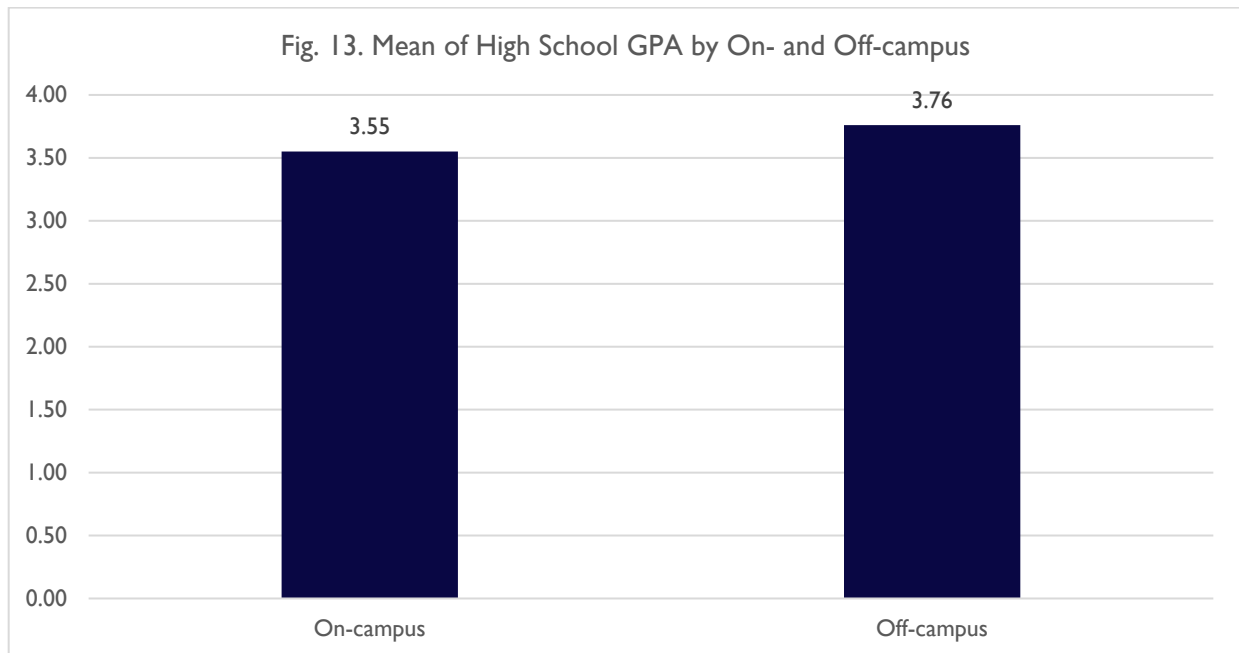
As can be seen in Fig 12, first gen students in an SNS LLC (96%) had a higher 1-year retention rate than non-first gen students in an SNS LLC (94%). The difference between the groups was not significant. First gen status in an SNS LLC increases retention; however, many factors may influence this association, so the difference cannot be attributed solely or primarily to participation in an LLC or first gen status.



## No LLC On- and Off-campus Groups

### Outcome I:

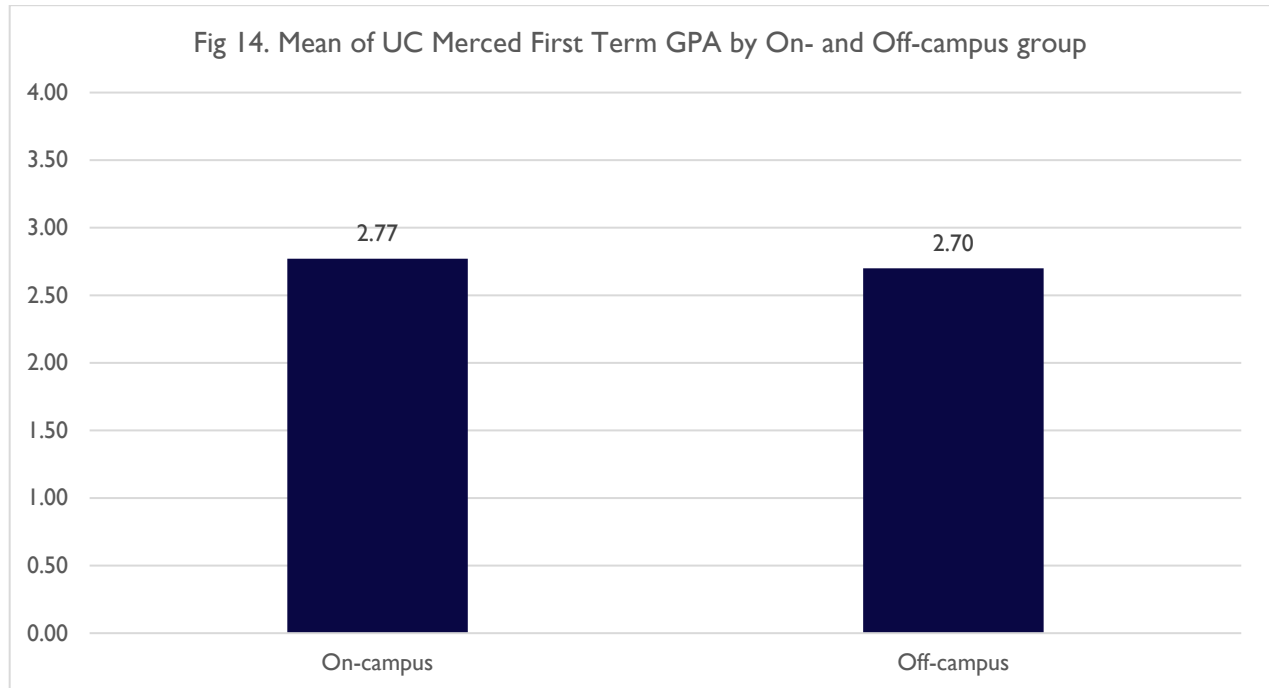
Average high school GPAs did differ between on- and off-campus students in No LLC, i.e. the students' high school performance differed, but the difference was not statistically significant<sup>21</sup>. As can be seen in Fig 7, the on-campus group (M=3.55) had a lower high school GPA than off-campus group (M = 3.76).



<sup>21</sup> p = .322.

## Outcome 2: UC Merced first term GPAs

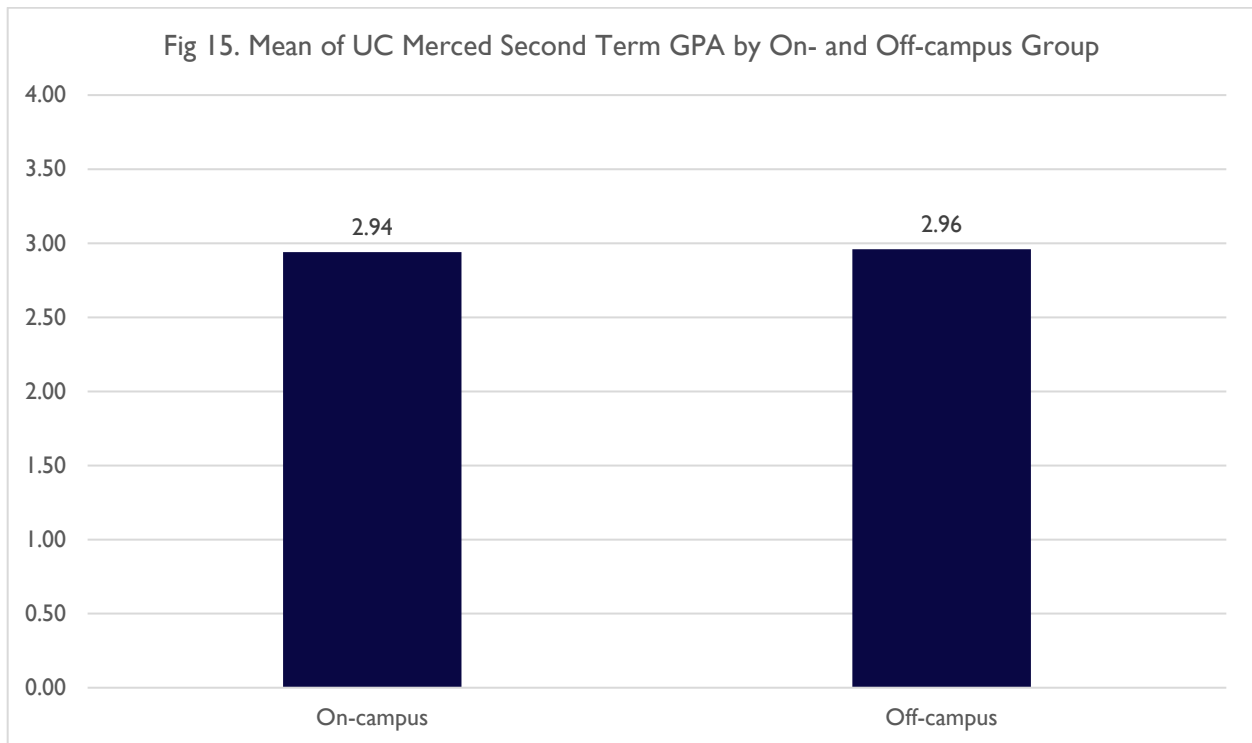
As can be seen in Fig 14, there were differences in average UC Merced first term GPAs between the on- and off-campus groups; these differences were statistically significant<sup>22</sup>, i.e on-campus students in No LLC perform better academically than off-campus students in No LLC. However, this difference disappeared at the end of the second semester. Many factors may influence this association, so the difference cannot be attributed solely or primarily to on- or off-campus status.



<sup>22</sup> p=.011

## Outcome 3: UC Merced Second Term GPAs

As can be seen in Fig 15, there was almost no difference in average UC Merced second term GPAs between the on- and off-campus groups; these differences were not statistically significant<sup>23</sup>. After two semesters, on-campus students in No LLC perform roughly the same academically as off-campus students in No LLC; better performance by on-campus students in the first term have disappeared. Only students who were retained to the second term were included.

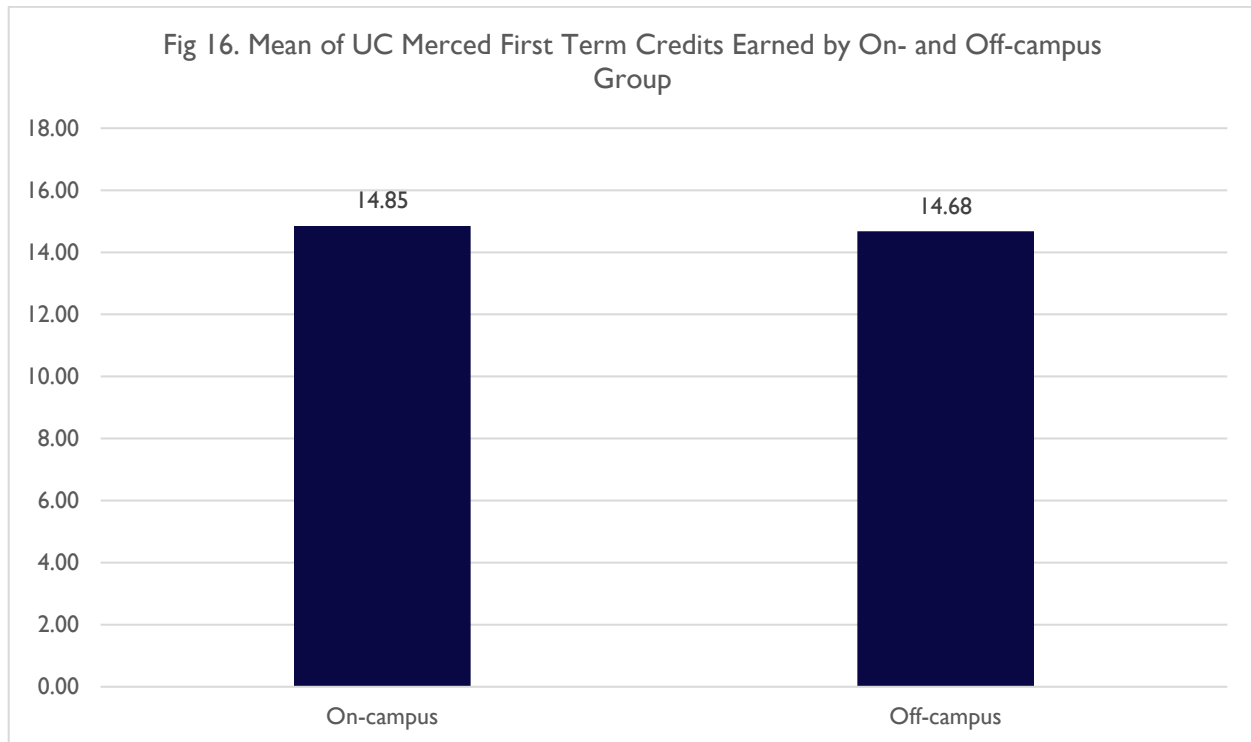


<sup>23</sup> p = .651



## Outcome 4: UC Merced First Term Credits Earned

As can be seen in Fig 16, on-campus students in No LLC (M=14.85) earned slightly more UC Merced first-term credits on average than off-campus students in No LLC (M=14.68). When rounded up, all average end of term credits earned followed UC Merced’s normal progress policy, which requires an average of 15 credits per term<sup>24</sup>. However, no statistical test could be performed<sup>25</sup> such that this result should be interpreted with caution.

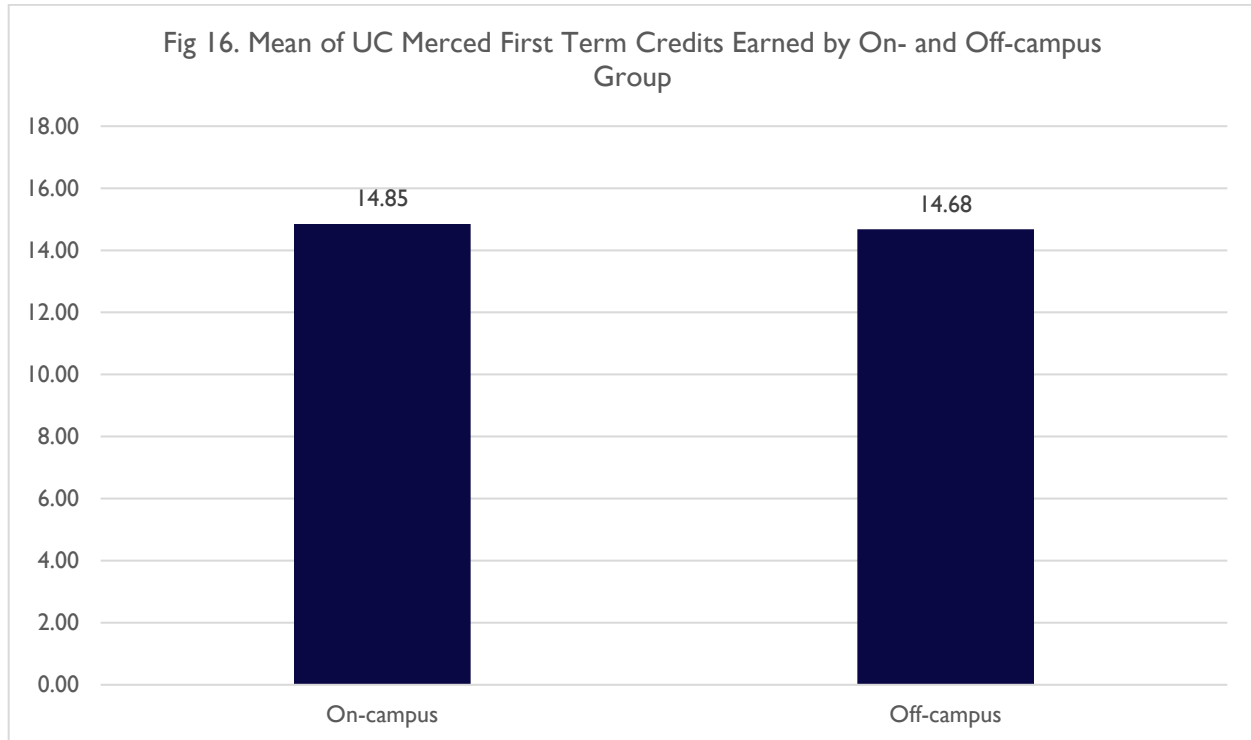


<sup>24</sup> <https://enr-advising.ucmerced.edu/policies/normal-progress>

<sup>25</sup> The distribution violated the assumptions of the statistical test such that no statistical comparison could be performed.

## Outcome 5: UC Merced Second Term Credits Earned

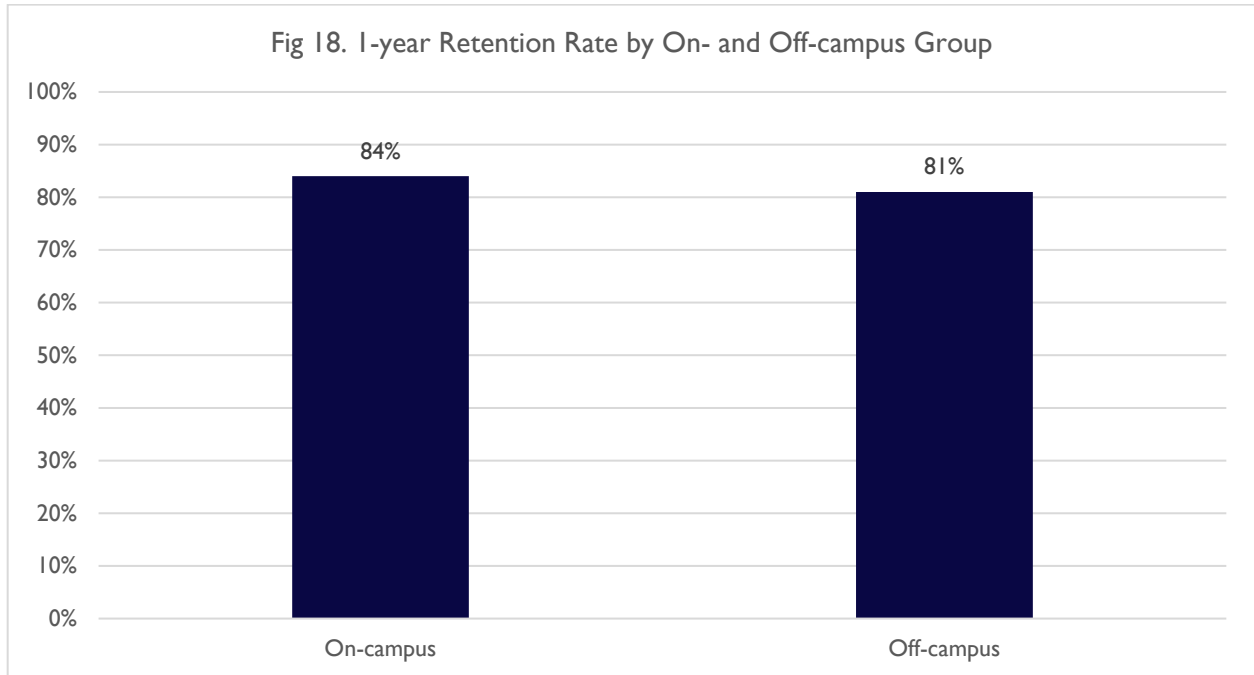
As can be seen in Fig 17, on-campus students in No LLC (M=15.43) earned slightly more UC Merced first-term credits on average than off-campus students in No LLC (M=15.06). All average end of term credits earned followed UC Merced's normal progress policy, which requires an average of 15 credits per term. However, no statistical test could be performed<sup>26</sup> such that this result should be interpreted with caution.



<sup>26</sup> The distribution violated the assumptions of the statistical test such that no statistical comparison could be performed.

## Outcome 6: I-Year Retention Rate

As can be seen in Fig 18, on-campus students in No LLC (84%) had a higher 1-year retention rate than off-campus students in No LLC (81%). The difference between the groups was not significant. On-campus status in No LLC increases retention; however, many factors may influence this association, so the difference cannot be attributed solely or primarily on-campus status.



### Conclusion

Overall, with the exception of 1-year retention rate, there were very few differences in the outcomes of interest between the LLC groups. Students in an Other LLC had somewhat higher high school GPAs than those in an SNS LLC or No LLC, meaning they were higher performing in high school; while this was significant, the effect was very small and may not be practically meaningful. There were very small differences in UC Merced first and second term GPAs; LLC students do not perform better academically. There were also trends indicating that students in an SNS LLC earned one credit more on average than Other LLC and No LLC students at the end of their first and second terms at UC Merced. However, statistical tests could not be performed, and all LLC groups met the normal progress policy based on average credits earned such that this trend may not be meaningful. Among those students retained to the second semester, all groups completed an average of 30 credits after one year, the amount required for normal progression. SNS LLC students had a higher 1-year retention rate, indicating participation in a SNS LLC increases retention, although SNS LLC participation is not the only factor to consider.

There were few statistically significant differences between first gen and non-first gen students in an SNS LLC. First gen students in an SNS LLC had lower values than non-first gen students in an SNS LLC on high school GPA, and UCM first-term GPA; Non-first gen students performed better academically both in high school and their first semester at UC Merced; however, these differences were not statistically significant and disappeared by the second term. There was no practical difference between groups on UCM second term GPA. There was no practical difference in UCM first term credits attempted or earned. First gen students in an SNS LLC attempted and earned fewer UCM second term credits than non-first gen students in an SNS LLC. However, statistical tests could not be performed, and all groups met the normal progress policy based on average credits earned such that this trend may not be meaningful. First gen students in an SNS LLC had a higher 1-year retention rate than non-first gen students in an SNS LLC, but again, the difference was not significant.

With the exception of UC Merced first term GPA, there were few differences between on- and off-campus groups. Off-campus students in No LLC had a higher average high school GPA than on-campus students in No LLC, but the difference was not significant. Off-campus students in No LLC had a significantly lower UC Merced first-term end of term GPA, meaning they performed better academically, but this difference disappeared for UC Merced second term end of term GPA. Off-campus students in No LLC earned fewer first and second term credits than on-campus students in No LLC. However, statistical tests could not be performed, and all groups met the normal progress policy based on average credits earned such that this trend may not be meaningful. Off-campus students in No LLC had a lower 1-year retention rate than on-campus students in No LLC, but this difference was not significant.

There appear to be inconsistencies in the categorization of LLCs affecting the Other LLC group; data should be updated, and the analysis rerun. In addition, the analysis could use a narrower comparison group of non-LLC students, for example, incoming frosh in STEM majors. This would provide a more comparable group of students. More exploration into differences between demographic groups in LLCs, such as race, gender, and Pell eligibility could be performed.