The impact of race and students on poverty level in C-U

Background

History of Urbana and Champaign

Urbana is a city located in east Illinois, and the county seat of Champaign County. It lies on a plain with an average elevation of 732 ft, slightly lower than Champaign. The climate in Urbana is continental, with cold, snowy winters (average temperature is -1.5°C) and warm, sometimes hot summer (average temperature is 23°C). Also, as a Midwest city, it experiences thunderstorms regularly. The climate and varied soil types in Urbana enable the well-growth of agricultural products like soybeans and corn.

The Urbana area was first settles by Europeans in 1822, called as “Big Grove”, when the area was a wilderness covered with tall grass and groves. In the area where is nowadays Champaign County, the area’s three largest groves were the Salt Fork Grove in the east, Big Grove in the center, and the Sangamon Grove in the northwest. In 1832, the residents of Big Grove asked Illinois General Assembly to establish a separate county. In 1833, after the vote, the bill was passed successfully on February 20th. Since then, Champaign County was built, with Urbana as its seat.

In the 1850s Urbana was stimulated by the railroad. The first railroad Road that run through Champaign County was called the Illinois Central. It began construction in 1851 and connected Chicago to Urbana in 1854, which brought the explosion of population and economic.

According to documents, the population rose from 2645 to 14629 (almost 5.5 times) between 1850 and 1860, while the demographic changed a lot. Land investors, merchants and intellectuals from the East replaced the original framers, and the arose of construction employed many laborers and encouraged the construction business. Because of the increase of the population, the town expanded its boundaries. In 1855, Illinois Central Railroad placed its tracks two miles west of downtown Urbana, and five years later the emerging West Urbana neighborhood was renamed as “Champaign” when it acquired a city charter. Markets were also stimulated by the productions

and constructions from railroad, which showed as varieties of types of business occurred on the Main Street, the hub of activity.

The Morrill Act of 1862 granted each state in the United States a portion of land on which to establish a major public state university, while Illinois was one of seven commonwealths that had not formed a state university. After the four-year struggle for locating the new university, Urbana won after the 1867 meeting of the general assembly. Then in 1885 the university officially changed its name from "Illinois Industrial University" to "University of Illinois". Now, it's one of the biggest public universities in U.S. and has a worldwide good reputation. The major facilities of U of I distributed almost evenly in the Champaign and Urbana, and they are home to more than fifty thousand college students.

Population

Population	Champaign city, Illinois	Urbana city, Illinois
Population, Census, April 1, 2010	81,055	41,250
PEOPLE		
Population		
Population estimates, July 1, 2019, (V2019)	88,909	42,214
Population estimates base, April 1, 2010, (V2019)	81,246	42,136
Population, percent change - April 1, 2010 (estimates base) to July 1, 2019, (V2019)	9.4%	0.2%
Population, Census, April 1, 2020	88,302	38,336
Population, Census, April 1, 2010	81,055	41,250

Figure 1 Population and changes in past decade. Data Source: Census.gov

According to 2019 ACS Estimates, the population of Champaign city is 88909, and Urbana is 41250; compare them with 2010 ACS Estimates, the population of Champaign increased 9.4% while Urbana is stable in a 0.2% change. However, the numbers become odd when using the Decennial Census. Champaign shows a similar trend with the ACS Estimate, but Urbana has a sharp 7.1% drop. This is a significant decrease comparing with other cities who are suffering from population loss, not to mention the whole Champaign County is the one of fifteen counties who are gaining more people among all 102 counties in Illinois.

The difference in population change between the two twin cities may be explained by the methods and the timings. ACS is based on the questionnaire to see the changing social and

economic characteristics of the U.S. population [1], while Decennial Census aims to count every resident living in the country[2]. Besides, the ACS data used here is 2019, collected before the COVID-19; and the Decennial Census was collected in April 2020, when many college students worked from home due to the pandemic. Additionally, UIUC enrolled 51196 students in 2019, even greater than the population of Urbana.

Race

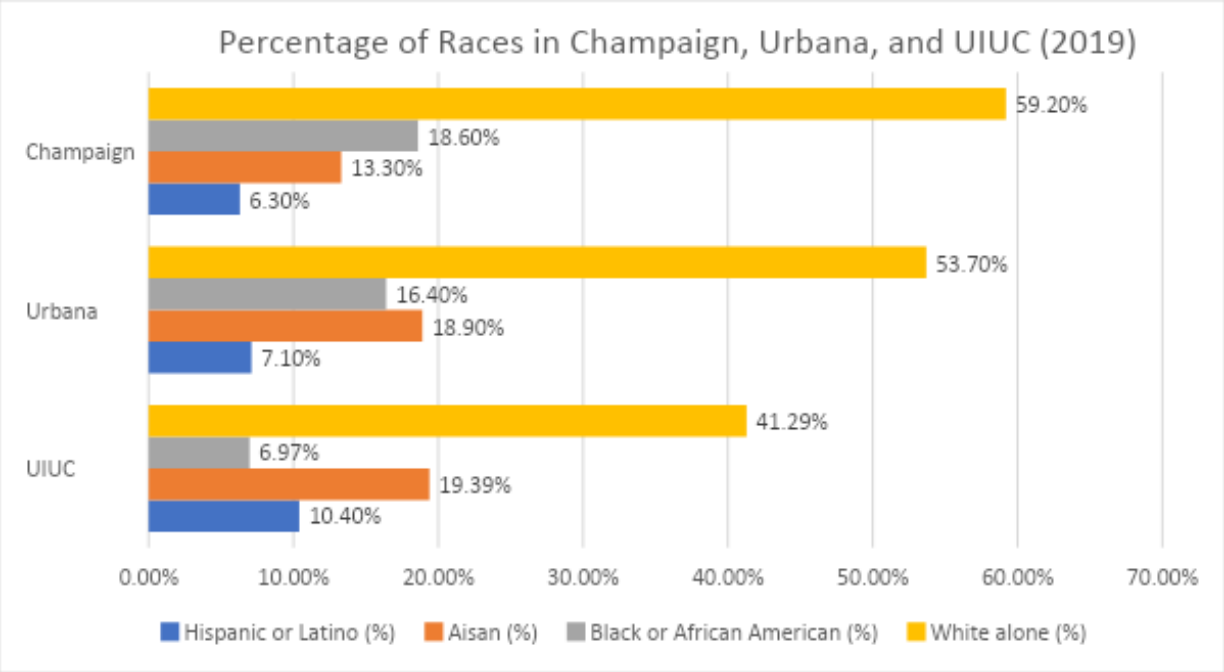
The chart below (Table 1) shows the percentage of four races (White, Black, Asian, and Hispanic or Latino) in Champaign, Urbana, and UIUC in 2019. Overall, Champaign and Urbana share a similar trend in racial distribution: 50%-60% for the major race, 20% for the second, around 15% for the third one, and 7% for the fourth. More than half of the population in Champaign or Urbana are White, which is the major race of the residents. The percentage in Champaign reaches nearly to 60%. The second biggest group takes almost 20% of the population, while in Champaign it's Black or African American and in Urbana it's Asian. The third biggest race in Champaign is Asian, taking 13.30%; and in Urbana it's Black or African American, taking 16.40% of the total population. The smallest race in both cities is Hispanic or Latino, taking around 7% of their population respectively.

UIUC has a different component. Though the White is still the biggest group, its portion is less than half (41%); the second biggest group is Asian, taking almost 20% of the total enrollment; the third is Hispanic or Latino with a 10.40% portion, and the last one is Black or African American, only 7%. Urbana and UIUC share a similar rank for all the four races, and the percentage of Asian is quite close.

1

2 https://www.census.gov/programs-surveys/decennial-census.html#:~:text=The%20U.S.%20census%20counts%20each,of%20Representatives%20among%20the%20states.

Table 1 Compare of percentages of race in Champaign-Urbana



Data source: Census.gov, QuickFacts, Population Estimate on July 1, 2019; *Fall 2019 10-Day Final Statistical Abstract compiled* by the Division of Management Information of UIUC

Age structure

Urbana is older while Champaign is younger. Compares with UIUC age structure!

The median age of Champaign is 27.2, and for Urbana it's 25.1. According to the definition of ageing population, Urbana's ageing population takes 11.25% of the whole population, slightly higher than Champaign's 9.90%. As the age pyramid shows below (Figure 2), Champaign has a significantly big age group within 20-25, and the group within 15-20 is the second biggest age group. At the same time, the biggest age group in Urbana is also 20-25, while the second largest is 25-30.

According to College Factual, more than 90% of the students in UIUC are within the range of 18-29 (see Appendix 2). After calculating the percentage of the population within this range in two cities (Table 2), Champaign has nearly 40% of the population of the students age, and Urbana has a higher portion, almost half of the population (48.49%).

Overall, the age structures in Champaign and Urbana are similar, slightly ageing, and with plenty of young adults. Besides they all have a large portion of population within the age range of UIUC students.

Table 2 Population in the student age

Age	Champaign	Urbana
18-19	7110	5684
20-21	9859	4299
22-24	8835	5781
25-29	7706	4949
Total	33510	20713
City Total	87636	42718
Percentage	38.24%	48.49%

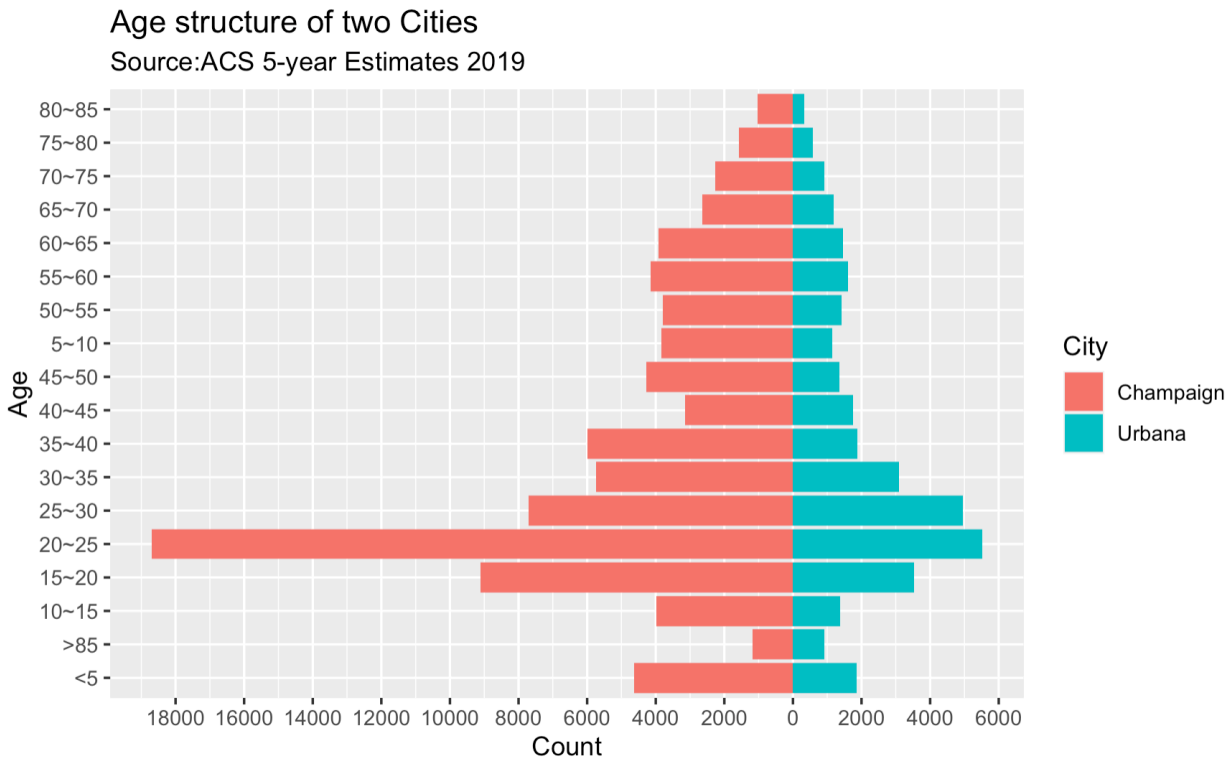


Figure 2 Age Pyramid of two cities

Poverty Rate

See the chart below; two assumptions to explain the high poverty level: college students, race

The poverty rates in Champaign and Urbana are significantly high. Urbana has almost 30% of population living under poverty, and Champaign has 25%, much higher than the 20% of county level and 11.5% of the state level. To see the poverty rate within race and age, see Figure 4 and Figure 5. Overall Asian has a highest poverty rate, and people that are 18-34 has the highest possibility to be poor.

The significant poverty level could be explained by race as well, but Figure 5 just shows the noticeable poverty rate in young adults (18-34), and this is the age range that most college students are within.

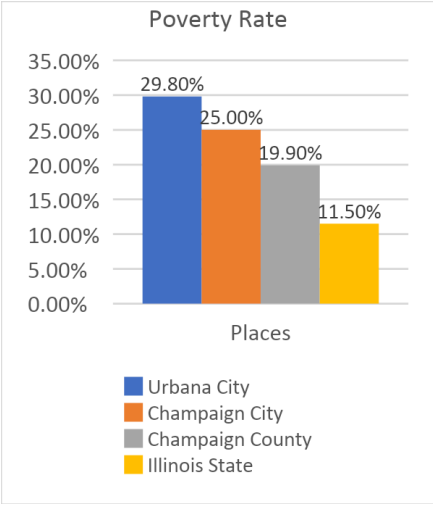


Figure 3 Poverty Rate of different places

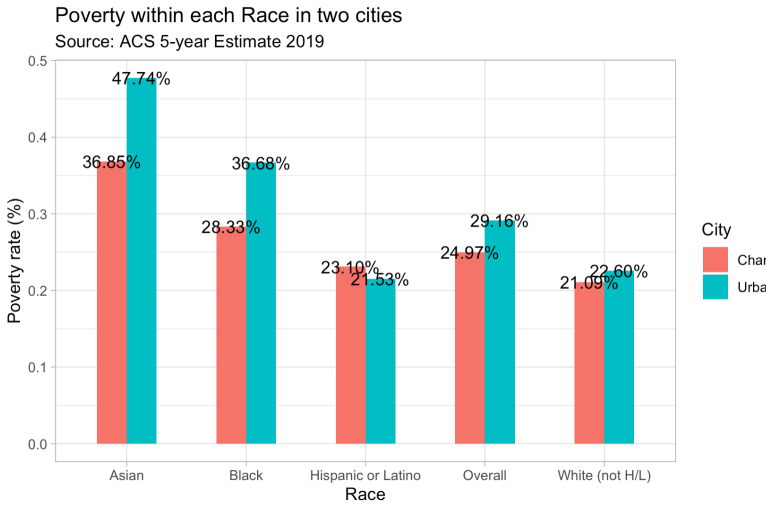


Figure 4 Poverty rate within different races

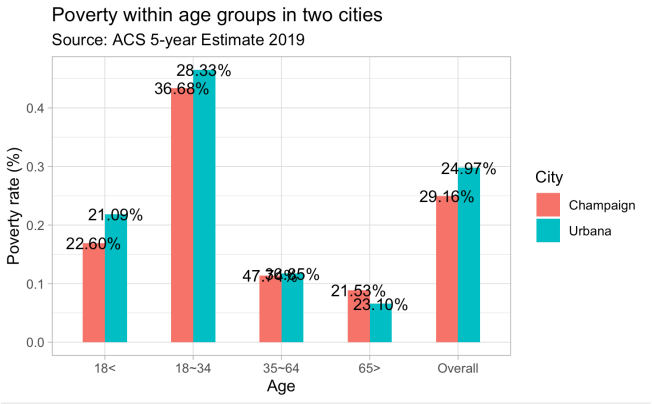


Figure 5 Poverty within age groups

College town

So may evidence lead to the conclusion that Champaign-Urbana is truly a college town. They are influenced, or even shaped by the university.

1. Population scale. UIUC enrolls over fifty thousand of students every year, higher than Urbana's population and more than half of Champaign's population. If UIUC has a township, then it's the second biggest city in Champaign-Urbana-Savoy area. Urbana's population even decreased 7% in the 2020 Decennial, and the most possible explanation is work-from-home college students.

2. Race composition. The rank of races' population in Urbana is really similar to UIUC, and the scale of Asian population is at the same level.

3. Age structure. Age between 18-29 take a large portion of population in both cities, while Urbana even has half of residents in this age range.

4. Poverty level. The poverty rates are significantly higher than county or state level. It's believed that the college towns see a higher poverty rate because of off-campus students living (Bishaw, 2013).

Methodology

This analysis aims to explore how much the college students affect the overall poverty status at a city scale. The smallest geography unit is census tract, and there are two indicators to reflect poverty status: income ratio, and non-student poverty rate.

The income ratio is an indicator calculated in this way:

Income Ratio = Median income of tract A / Median income of all the tracts in the region

The income ratio can reflect whether this tract has a below-average income or an above one. The income ratio must be a positive number.

Non-student poverty rate excludes the college students' impact on overall poverty rate (Rorem & Juday, 2016). To see the impact level, this study takes a step further to calculate the difference between official poverty rate and non-student poverty rate:

Student impact level = Official Poverty Rate – Non-student Poverty Rate

This study will use GIS to create map showing data, and R to create plots showing correlations.

GIS (Geography Information System) consists of the technology and systems that create, manage, analyze, and visualize geographic information. It's a tool to explore the spatial relationships, patterns, and processes of any geographic, cultural, biological, demographic, or physical phenomena. [3]

Data source

This study uses 2019 ACS (American Community Surveys) 5-year estimates from U.S. Census Bureau to find demographic data. The demographic data contains race (table ID: B01002), sex by age (table ID:B01001), median household income in the past 12 months (S1903), and poverty status in the past 12 months (table ID: S1701). To filter out the impact of students, this analysis uses the table titled "Poverty Status in the Past 12 Months by School Enrollment by Level of School for the Population 3 Years and Over" (table ID: B14006) as well. In GIS, the geographic maps derived data from TIGER/line database to get the shapefiles for census tracts. Besides lab contents from UP418 and UP503 are used as well.

First Analysis: Student impact

The first analysis is about students and poverty. Benson and Bishaw (2018) stated in their report that college towns see a higher poverty rate because of off-campus students living. The article *"How to modify poverty calculations for college towns"* (Rorem & Juday, 2016) provides a way to modify the impact of college students. They use the table B14006 from the 2014 ACS 5-year estimate as their database, filter out the non-student poverty population by "whether enrolled in college or graduate," and divide it by non-student total population. By then, they get the non-student poverty rate and compare it with the official one to see the difference. When the tract

[3] Slides from UP418 Fall 2021 Lecture 1

has a difference of more than 15%, it will be considered influenced most by students. This analysis refers to their methodology to do the analysis based on the 2019 ACS 5-year estimate in Champaign and Urbana.

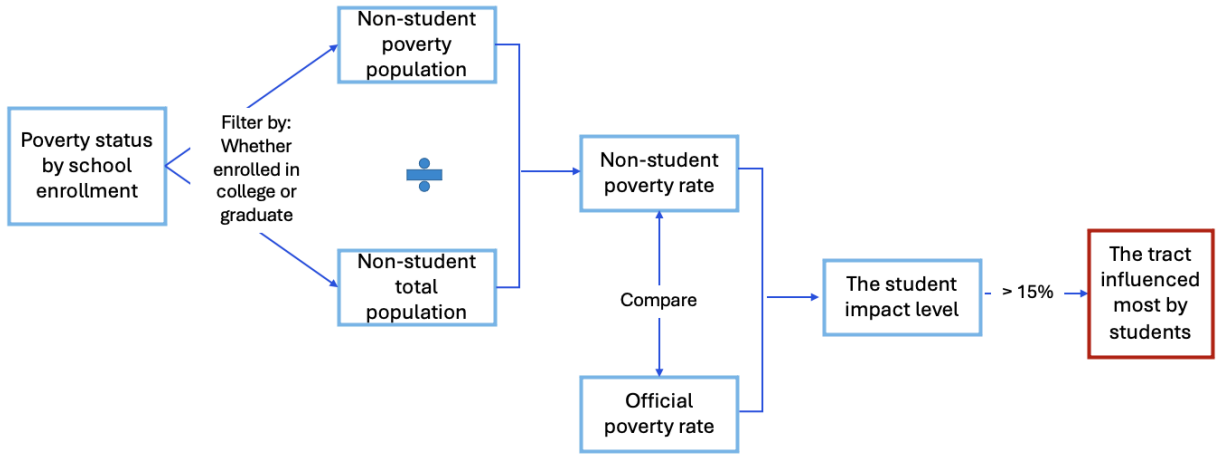
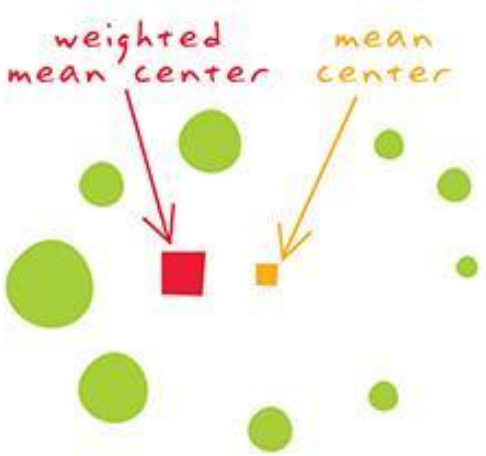


Figure 6 Workflow of excluding students' impact (Drawn by author)

Second Analysis: Race impact

What is weighted mean center in GIS, how can they be interpreted, what centers I use in my analysis.



The second analysis is to examine the relationship between race and income. The analysis starts from adding the population by race, including the White, Black, Asian, and Hispanic or Latino, to the census tracts by GEOID. Then the analysis goes to the weighted mean center of each race separately with the tool in GIS "Mean Center," setting population as the weight field. The weighted mean center can reflect the spatial distribution of selected attributes, like population, on maps. Thus, these race centers show the spatial distribution of each race. The same methodology is also applied to median household income, which could reflect the wealth

distribution. The next step is adding all five centers to one map to compare the distribution of income and race.

The correlation is created in ggplot in R to create a scatter point with a linear line to see the relationship between race and income ratio. This analysis sets the percentage of white as x, and the income ratio as y to generate the plot. If the correlation is positive, then more white people a tract has, higher the median income is. After that this study uses the percentage of non-white to examine the correlation again.

Findings and Analysis

College students' impact

This map has four layers: the weighted mean center of income, the weighted mean center of poverty rate, the differences between official poverty rate and non-student poverty rate in each tract, and the red outlined ones are those with a difference higher than 15%.

The first finding here is between the two mean centers. The separation of the poverty rate center and income center shows that the people under poverty are far away from those with higher income, concentrating in the northeast tracts.

The second finding is about the differences. The difference level is considerably high, as some tracts could reach 40%. Furthermore, the most influenced tracts (difference >15%) are those within or near the campus boundary, concentrating in west Urbana, where the population density is highest as well (see Appendix 3). These two findings explain that these tracts rely more on off-campus students living, so students contribute a lot to the overall poverty level. Besides, these findings echo to the overall higher poverty rates in Urbana (Figure 4), and the higher poverty rates in younger adults between Champaign and Urbana (Figure 5).

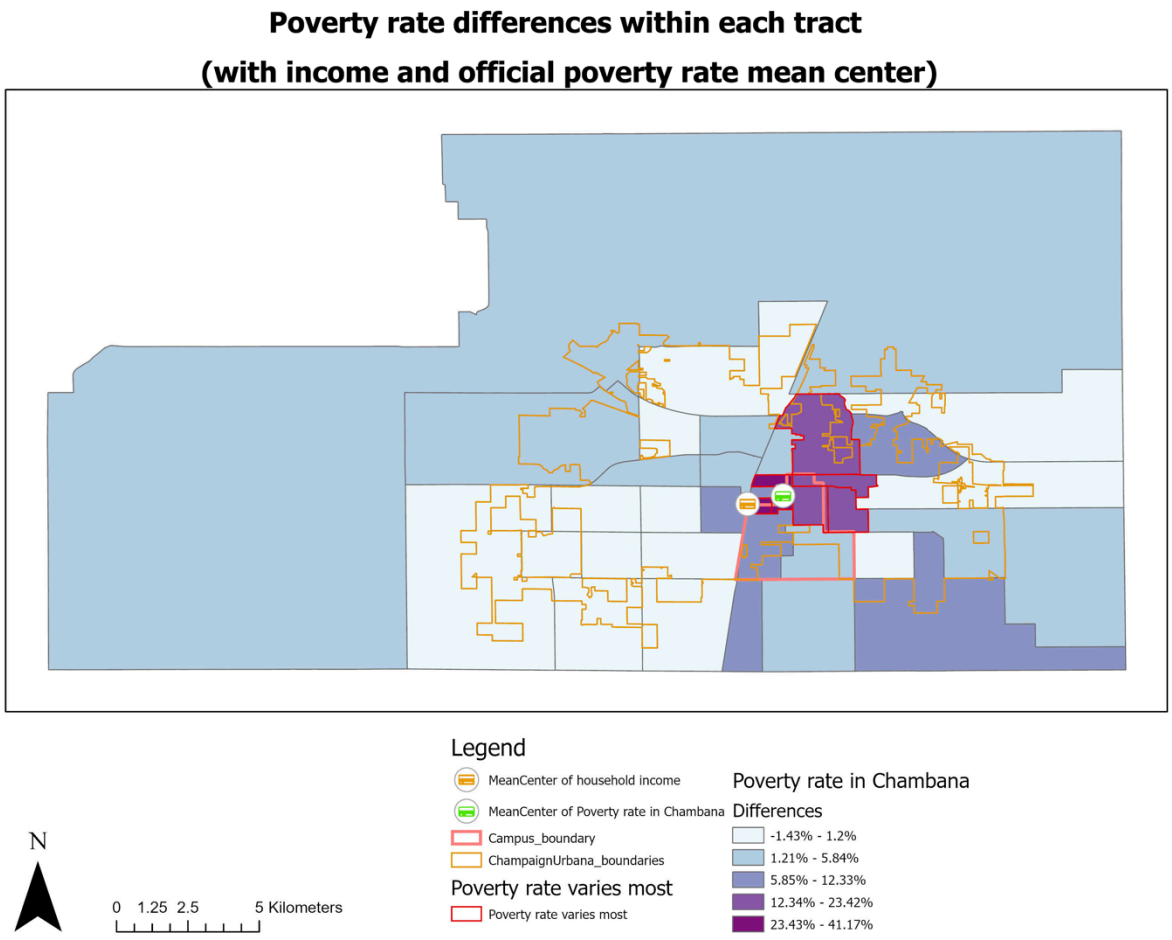


Figure 8 Poverty rate differences within each tract

Race impact

The Figure 9 is about the spatial distribution of races and income, including five weighted mean centers, and all the weight field is population. It zooms in to show them clearly (to see the whole map with income ratio, see Appendix 4). The nearer the racial center is to the income center, the higher income this race has. From this map, the weighted mean centers of the Black and Asian are both far away from the income center, while the centers of White and Hispanic are closer to it. This map shows that the way the Black and the Asian concentrate is different from how the income does, meaning they earn less income than the White and Hispanic people. This responds to the trend of poverty rate within each race (Figure 4), where it shows that the Asian and the Black are the two races with higher population below poverty, and the White and the Hispanic are the lower two.

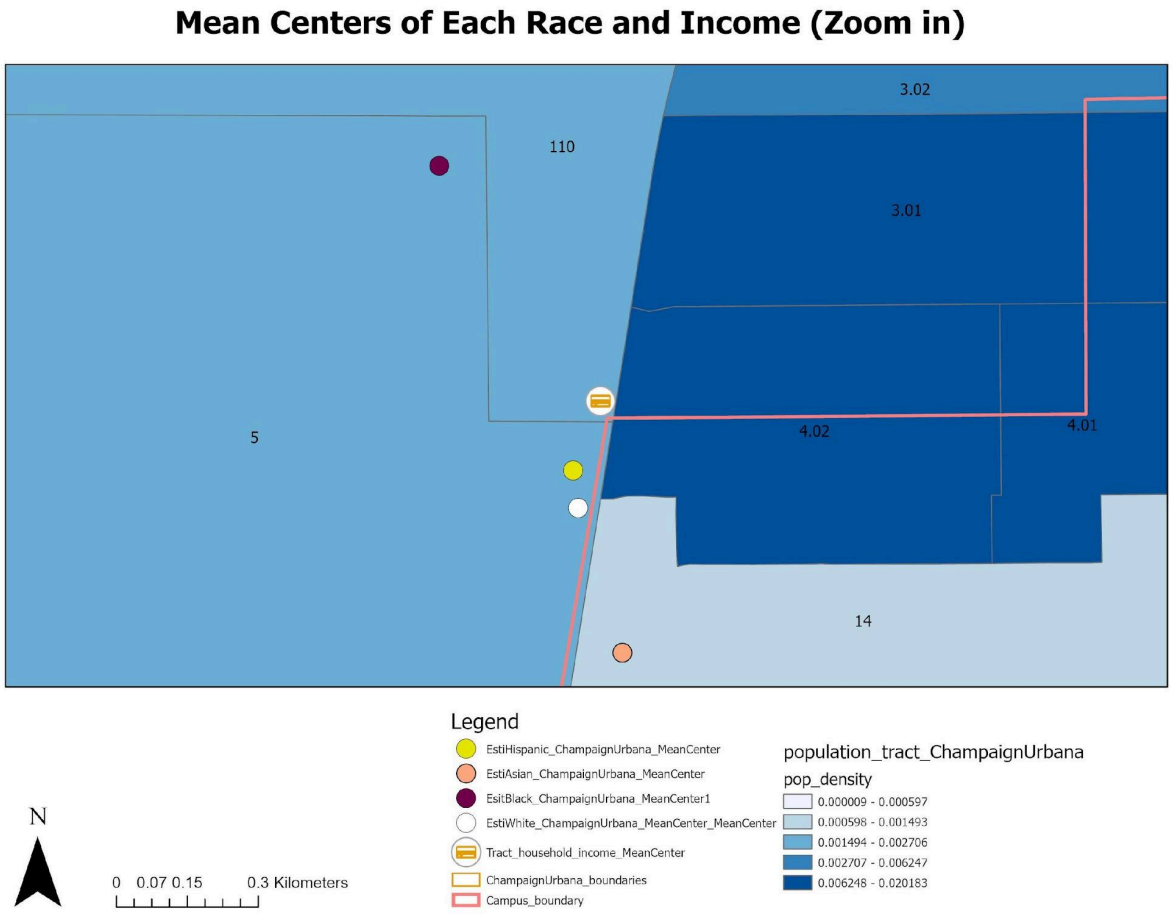


Figure 9 Mean Centers of Each Race and Income

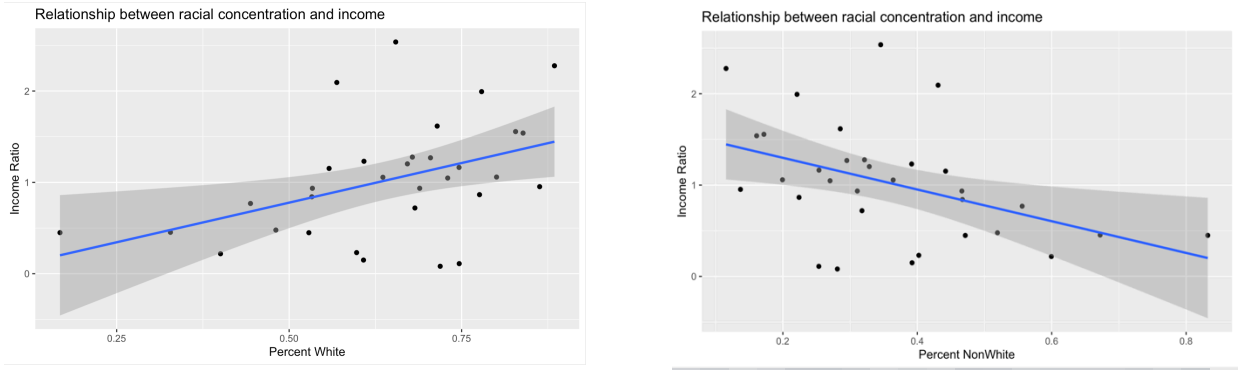


Figure 10 Correlation of White and Income Ratio

To illustrate this trend more reliably, the scatter plot with a linear line (Figure 10) just shows the relationship between the percentage of white and the income ratio. Each dot represents a tract, with a total amount of 33. This plot shows that the higher the percentage of white people a tract has, the higher the median income. Then the analysis re-examines this relationship by alternating the x-axis

as the percentage of non-white, and it displays a negative correlation (see Figure 11). These graphics again prove the income inequality by race.

Implications for policy and impact

This study reflects how race and students influence poverty in Champaign-Urbana. As a college town, it's not surprised to find that students greatly impact Champaign-Urbana, but the race impact is obvious as many American cities. The measurement of students' impact is critical because it helps with the local officials to identify the poverty status clearly, especially in college towns. They can identify who are situationally poor and who aren't, thus set more reasonable goals for decreasing poverty. Planners can see the overall level of students' impact on a town, and then decide how much development should be considered for students. In general, For policymakers and planners, such a study could provide an aspect to understand the city better, knowing the real reasons for those numbers, thus making a better decision.

References

Qiushi. H. (2021). *The impact of race and students on poverty level in Champaign-Urbana.* [Unpublished manuscript]. UP 418. University of Illinois at Urbana-Champaign.

Qiushi. H. (2021). *Population Memorandum.* [Unpublished manuscript]. UP494. University of Illinois at Urbana-Champaign.

U.S. Census Bureau. (2021). Decennial Census of Population and Housing. Retrieved 23 November 2021, from https://www.census.gov/programs-surveys/decennial-census.html#:~:text=The%20U.S.%20census%20counts%20each,of%20Representatives%20among%20the%20states.

Understanding and Using American Community Survey Data. (2020). Retrieved 11 December 2021, from https://www.census.gov/content/dam/Census/library/publications/2020/acs/acs_general_handbook_2020_ch09.pdf

Bishaw, A. (2013). Examining the Effect of Off-Campus College Students on Poverty Rates. Retrieved 8 October 2021, from https://www.census.gov/content/dam/Census/library/working-papers/2013/acs/2013_Bishaw_01.pdf

Benson, C. and Bishaw, A., 2018. Small and Large College Towns See Higher Poverty Rates. [online] Census.gov. Available at: <https://www.census.gov/library/stories/2018/10/off-campus-college-students-poverty.html> [Accessed 8 October 2021].

Rorem, A., & Juday, L. (2016). Accounting for college students in poverty rates | StatChat. Retrieved 7 December 2021, from http://statchatva.org/2016/03/07/how-to-modify-poverty-calculations-for-college-towns/

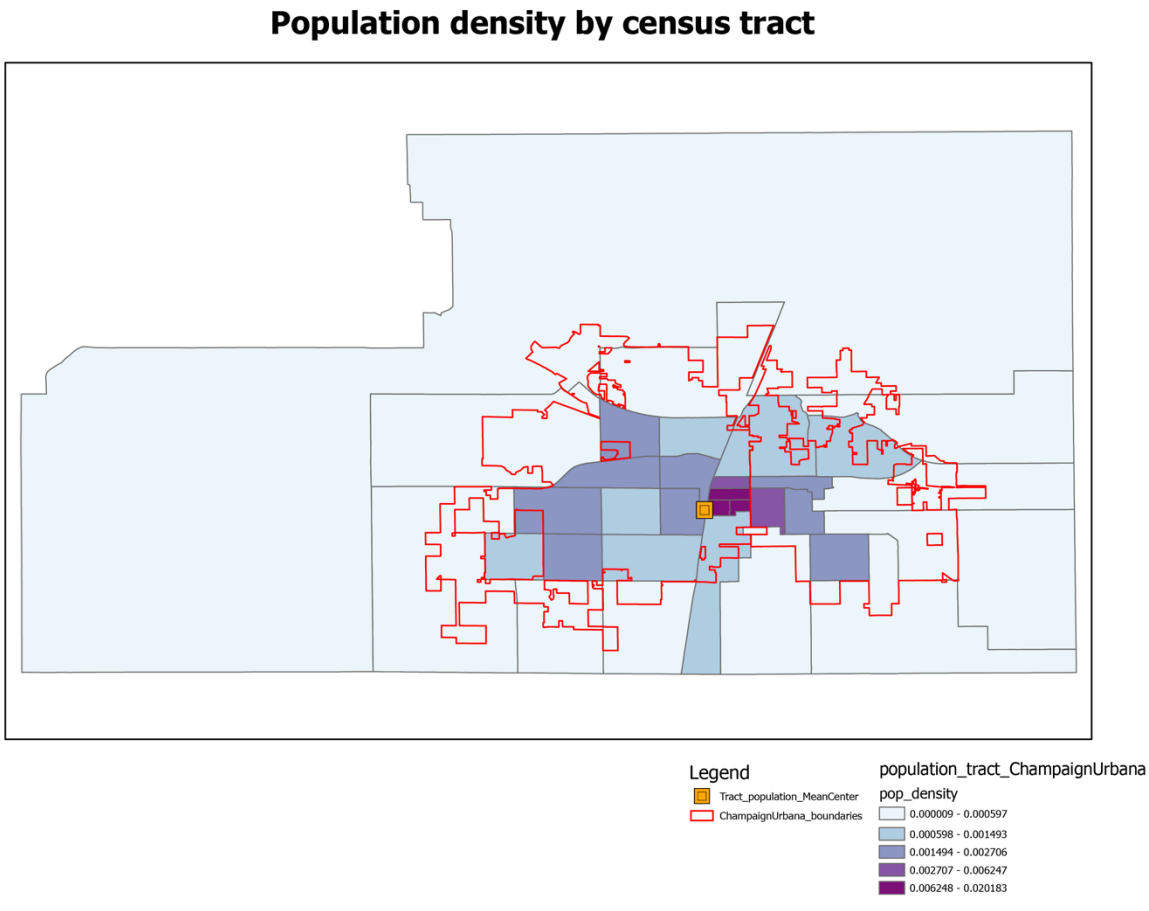
Appendix

Age	Urbana	Champaign
<5	1865	4630
5~10	1154	3829
10~15	1380	3976
15~20	3538	9101
20~25	5519	18694
25~30	4949	7706
30~35	3090	5733
35~40	1887	5993
40~45	1749	3151
45~50	1353	4282
50~55	1416	3803
55~60	1611	4141
60~65	1463	3917
65~70	1198	2637
70~75	917	2265
75~80	577	1572
80~85	325	1022
>85	908	1184
Ageing rate (>65)	11.25%	9.90%

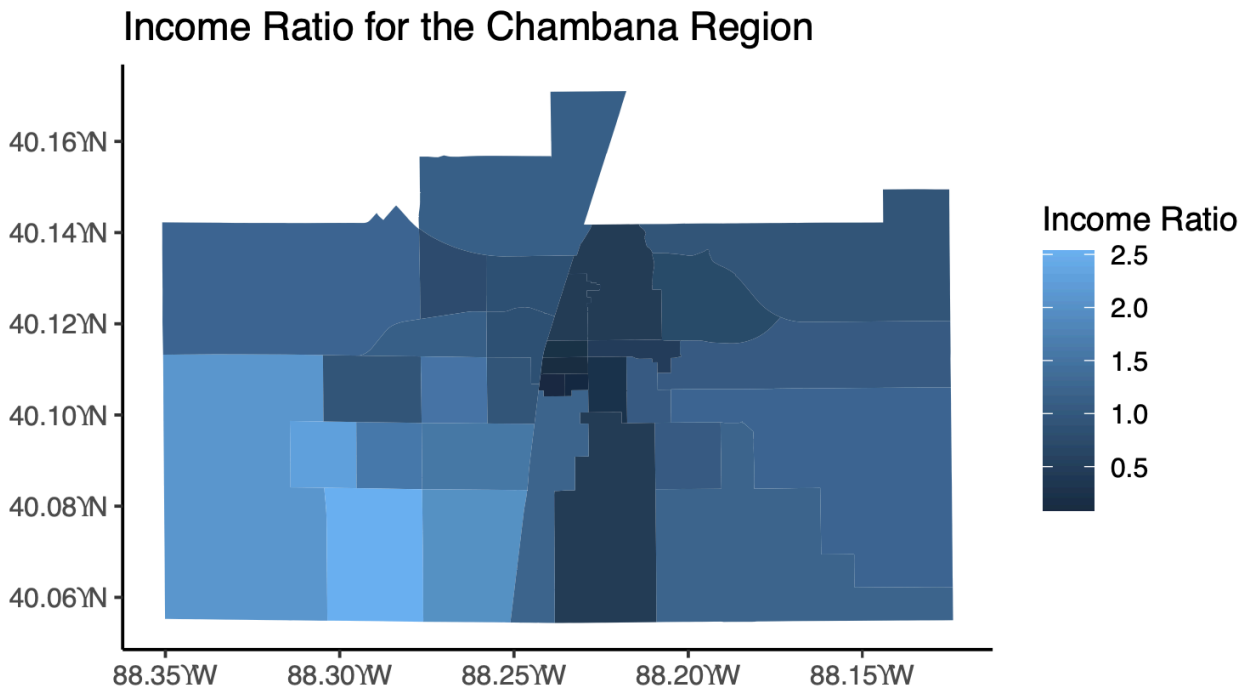
Appendix 1 Population counts of Champaign and Urbana (2019 ACS 5-y Estimate)

Student Age Group	Number	Percent
20-21	15,369	31.88%
18-19	14,482	30.04%
22-24	8,226	17.06%
25-29	5,181	10.75%
30-34	2,135	4.43%
35 and over	2,077	4.31%

Appendix 2 Student age of UIUC (2019)



Appendix 3 Population density by census tract



Appendix 4 Income Ratio for the Champaign-Urbana Region