

ENVIRONMENTALLY DISADVANTAGED: UNDERSTANDING FULLERTON COLLEGE STUDENTS' GEOGRAPHIES OF ACCESS TO FRESH FOODS, GREEN SPACES, AND CLEAN ENVIRONMENTS.



An anti-racism research project (Fall 2020 – Spring 2022) by:

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ABSTRACT

Scholars from the Geography Department and Office of Institutional Research and Effectiveness (OIRE) of Fullerton College utilized Geographic Information Systems (GIS) to map student populations in relation to state and nationally defined geographies of environmental disadvantage based on neighborhood-level metrics of access to fresh foods, green spaces, and clean environments. The mapping analysis revealed that, consistent with statewide patterns, Black, Latinx, first generation, and economically disadvantaged students disproportionately reside in environmentally disadvantaged neighborhoods. Through mapping the environmental contexts of FC students, we can begin to bridge our understanding and commitments to antiracism and environmental sustainability and devise strategies to respond to the needs of students living at intersections of geographical deprivation. This is the first collaboration between OIRE and the Geography Department and the first spatial analysis of environmental justice produced internally at Fullerton College. In light of the research findings, we offer several possible directions for GIS analysis to be applied into the college's research and planning capabilities to better serve marginalized student populations.

1. INTRODUCTION

On October 2020, Fullerton College adopted a commitment to becoming an antiracist institution by identifying and beginning to dismantle interlocking systems of oppression. Fullerton College's Antiracism statement calls on the campus community to "engage in critical reflection" to dismantle racism and to "devise a comprehensive strategy" for addressing it¹. In May of 2021, NOCCCD adopted a Sustainability Policy 3580 that affirms that environmental sustainability is a foundational principle in shaping the present and its vision for a brighter future. Subsequently, in February 2022, the Sustainability Administrative Procedure 3580² establishes a sustainability framework that directs planning and administration to promote equity and wellbeing of students as components

¹ Fullerton College's Antiracism Statement https://www.fullcoll.edu/wp-content/uploads/2020/11/Fullerton-College_AntiRacism-Statement_PAC-Oct-28.pdf

² NOCCCD Sustainability Policy & Administrative Procedure

of sustainability. Yet, so far, the aspirations for antiracism and environmental sustainability have not been connected in Fullerton College's planning documents. Taskforce efforts conducted by a myriad of groups within NOCCCD have been focused on student equity in various areas – but there has been little to no attention to the environmental disadvantages of Fullerton College students.

In an effort to bridge this gap, scholars from the Geography Department and Office of Institutional Research applied Geographic Information Systems (GIS) to map our student populations and associated demographic variables in correspondence to state and nationally defined geographies of environmental disadvantage – focusing on the latest metrics of access to fresh foods (US Department of Agriculture, USDA), green spaces (California Parks and Recreation), and clean environments (California Environmental Protection Agency & the EnviroScreen 3.0). The aim of this research is to 1) connect our understanding and efforts in antiracism and environmental sustainability by contextualizing Fullerton College students' geographies of environmental disadvantage; 2) provide information that may devise strategies to respond to the needs of students living at intersections of environmental deprivation; and 3) highlight the value of geographical data analysis as an integral dimension of institutional research and informed decision-making. In light of the research findings we also 4) offer simply action items that can help the college move the needle in connecting students to needed resources.

Academic research has long established that environmental racism is a common experience in America. While the term is often used to describe the disproportionate exposure of communities of color to pollution, environmental disadvantages such as lack of access to nutritional foods and green spaces also vary along ethnoracial lines. We see this study as an opportunity to engage the campus community in critical reflection about this reality, the environmental inequities of our student neighborhoods, and the need for access to nutrition and green spaces on campus, greater education and advocacy for environmental justice, and increased access to campus resources via accessible interactive maps. While advancing environmental justice must be a multi-scale commitment of public decision-making bodies, educational institutions are uniquely positioned to help bridge geographies of disadvantage with an institutional design that carves equitable sustainability in physical structures, operations, and planning.

2. DATA & METHODS

Fullerton College Student Data

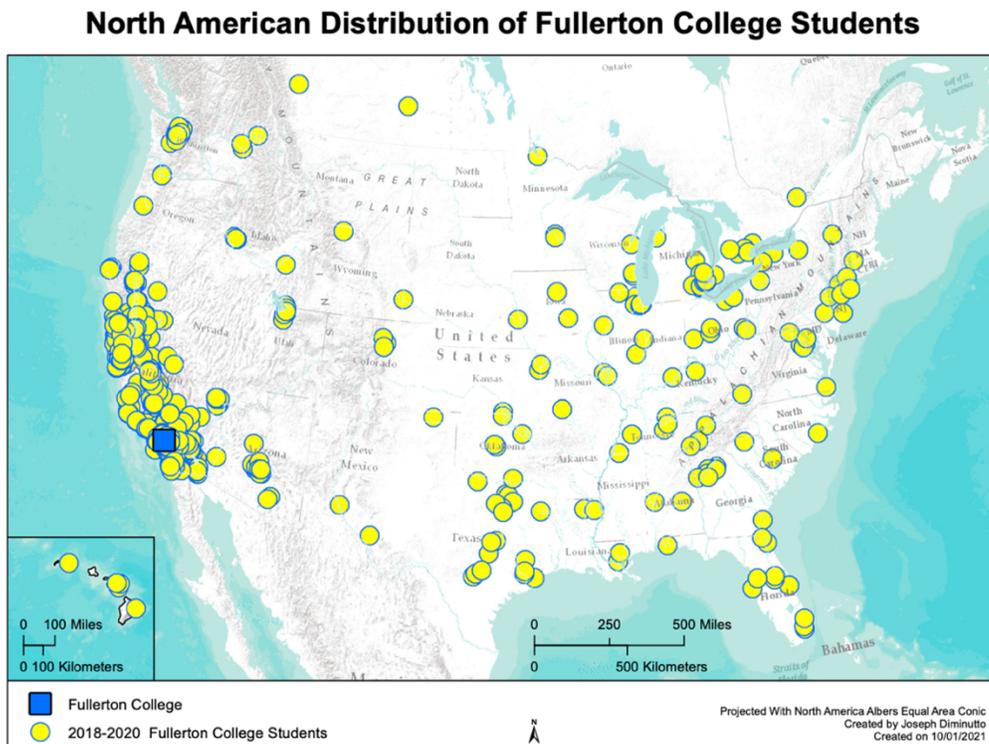
Our research team geocoded student data for two academic years (AY 2019/2020 & AY 2020/2021), based on student mailing addresses on record. Mailing addresses may help us understand less temporary but nonetheless localized living situations such as that of international students. The total number of students mapped exclude mailing address entries that contained texting errors, misspellings, missing addresses, and international addresses which did not allow for geocoding. PO Boxes were also excluded, as they may not necessarily represent students' geographical contexts. These exclusions accounted for about 0.7% of unique students enrolled in AY 2019/200 & AY 2020/2021. Student data was geocoded and mapped to protect student privacy, with omissions of data points at

identifiable mapping scales and removed names from attributes table. The geodatabase from this project maintained internally with our OIRE.

Given the tidal changes associated with the COVID-19 pandemic in Spring 2020 and on, we isolated Fall 2019 as the baseline semester most useful to depict student geographies in a pre-pandemic scenario, thus this study is focused on this term. This dataset includes unduplicated geocoded headcounts of students enrolled at Fullerton College in Fall 2019 and their associated variables: gender, age, race/ethnicity and whether they are identified as economically disadvantaged, first generation, and/or recipients of financial aid. This focus on both race/ethnicity and economic disadvantage as a focus for equity analysis is in line with environmental equity research.

A total of 22, 857 students who enrolled at Fullerton College in the Fall of 2019 were mapped based on their mailing addresses, with the aforementioned minor exclusions (Figure 1). In the Fall of 2019, there were 223 international students with F1 or M1 Visas. International students with mailing addresses in the So Cal region are included in this study. Given that close to 99% of FC students mailing addresses were located in Southern California, we have bound our study region to this geographical area, a conceptual region defined by county boundaries, mapped below (Figure 2). Within So Cal, most students live in Orange County (74%) and Los Angeles County (20%).

Figure 1. Map of FC Fall 2019 students in North America



Distribution of Fullerton College Students in Southern California

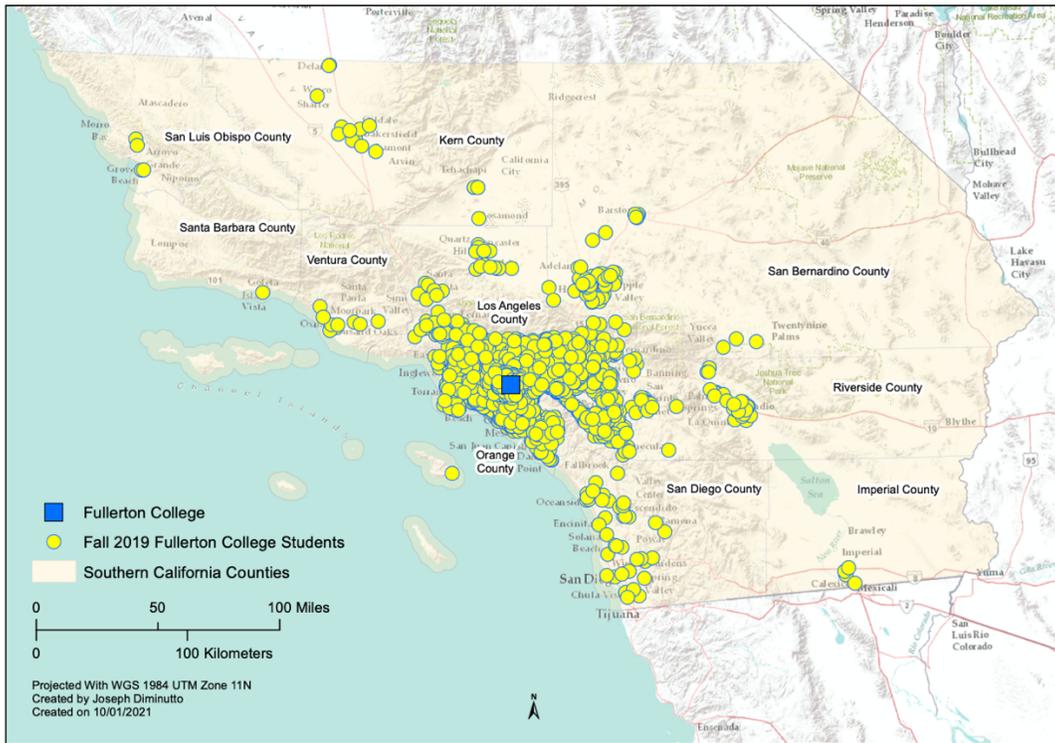


Figure 2 So Cal Region: 99% of FC students in Fall 2019 reside in So Cal

For this geographical analysis, we layered the geographical data of FC students atop established geographies of environmental disadvantage at the census tract level, as recognized by the USDA (food deserts), California Parks and Recreation (green spaces), as well as the Environmental Protection Agency (Enviroscreen 3.0). Food deserts, park poor, and disadvantaged communities are commonly used geographical terms among planning agencies in the state of California and widely recognized as geographies of disadvantage. As defined by respective planning agencies, these census tracts are described, discussed, and analyzed in the discussion section of this report.

As we write this report, we realize that some of this data requires revisiting as new census tract data gets updated due to the 2020 Census. Furthermore, with the abrupt transition to distance education, it remains to be seen how or whether Fullerton College student geographies will change substantially in the long-term. A quick comparison between Fall 2019 and Fall 2020 shows that in 2020, still about 98% of FC students were still within the So Cal region, with 73% in Orange County and about 20% in Los Angeles County. Furthermore, the city level distribution is relatively the same in Fall 2021 with most students coming from Anaheim (23%), Fullerton (16%), La Habra (7%), Whittier (6%), and Placentia (4%) – comparing Fall 2019 to Fall 2021 only shows one percentage point decrease in students coming from Anaheim and Fullerton. Thus, observing the geographies of disadvantage of Fall 2019 students within this geographical region

remains relevant. It is possible that new geographical patterns emerge with greater shares of courses remaining online in a post-pandemic scenario.

Demographic snapshot of students in the Fall of 2019.

RACE/ETHNICITY			AGE		
	n	%			
Asian	3162	13.83%	19 or less	8,640	37.80%
Black	646	2.83%	20-24	8341	36.49%
Latinx/Hispanic	13221	57.84%	25-29	2781	12.17%
Native American	53	0.23%	30-34	1200	5.25%
Pacific Islander	52	0.23%	35-39	638	2.79%
Two or more races	768	3.36%	40-49	702	3.07%
Unreported	1019	4.46%	50+	551	2.41%
White	3936	17.22%	unknown	4	0.02%
TOTAL	22857		TOTAL	22,857	
FIRST GENERATION 34.76%			GENDER		
Asian	517	6.51%	Female	11816	51.70%
Black	153	1.93%	Male	10,638	46.54%
Latinx/Hispanic	6179	77.77%	N'	403	1.76%
Native American	9	0.11%	ECONOMICALLY DISADVANTAGED & FIRST GEN		
Pacific Islander	14	0.18%	Asian	460	6.27%
Two or more races	126	1.59%	Black	146	1.99%
Unreported	358	4.51%	Latinx/Hispanic	5808	79.11%
White	589	7.41%	Native American	9	0.12%
TOTAL	7945	34.76%	Pacific Islander	13	0.18%
ECONOMICALLY DISADVANTAGED 83.77%			Two or more races	115	1.57%
Asian	2542	13.28%	Unreported	293	3.99%
Black	590	3.08%	White	498	6.78%
Latinx/Hispanic	11836	61.82%	TOTAL	7342	92.41%
Native American	46	0.24%	FINANCIAL AID RECIPIENTS 12,723 55.66%		
Pacific Islander	47	0.25%	First gen receiving financial aid	5239	65.94%
Two or more races	598	3.12%	Economically disadvantaged without financial aid 6459 33.73%		
Unreported	734	3.83%	Asian	1,041	16.12%
White	2754	14.38%	Black	103	1.59%
TOTAL	19147	83.77%	Latinx/Hispanic	3692	57.16%
			Native American	14	0.22%
			Pacific Islander	16	0.25%
			Two or more races	190	2.94%
			Unreported	281	4.35%
			White	1122	17.37%

Definitions

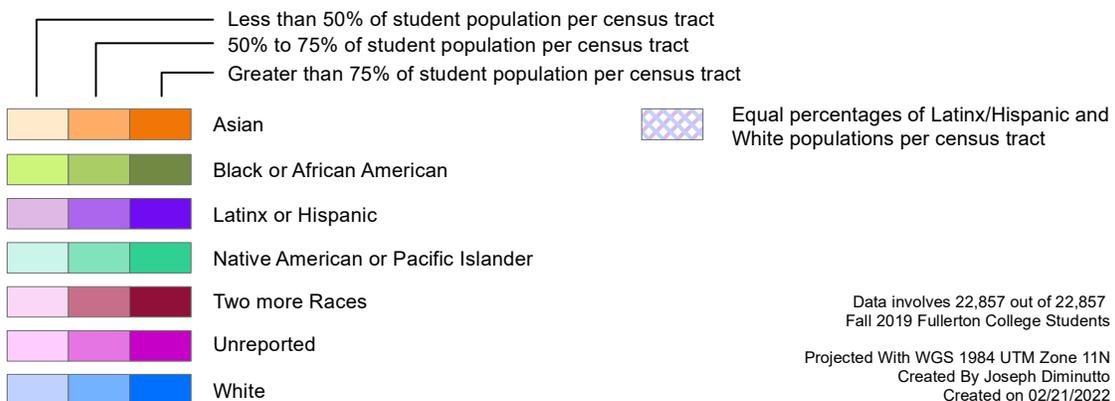
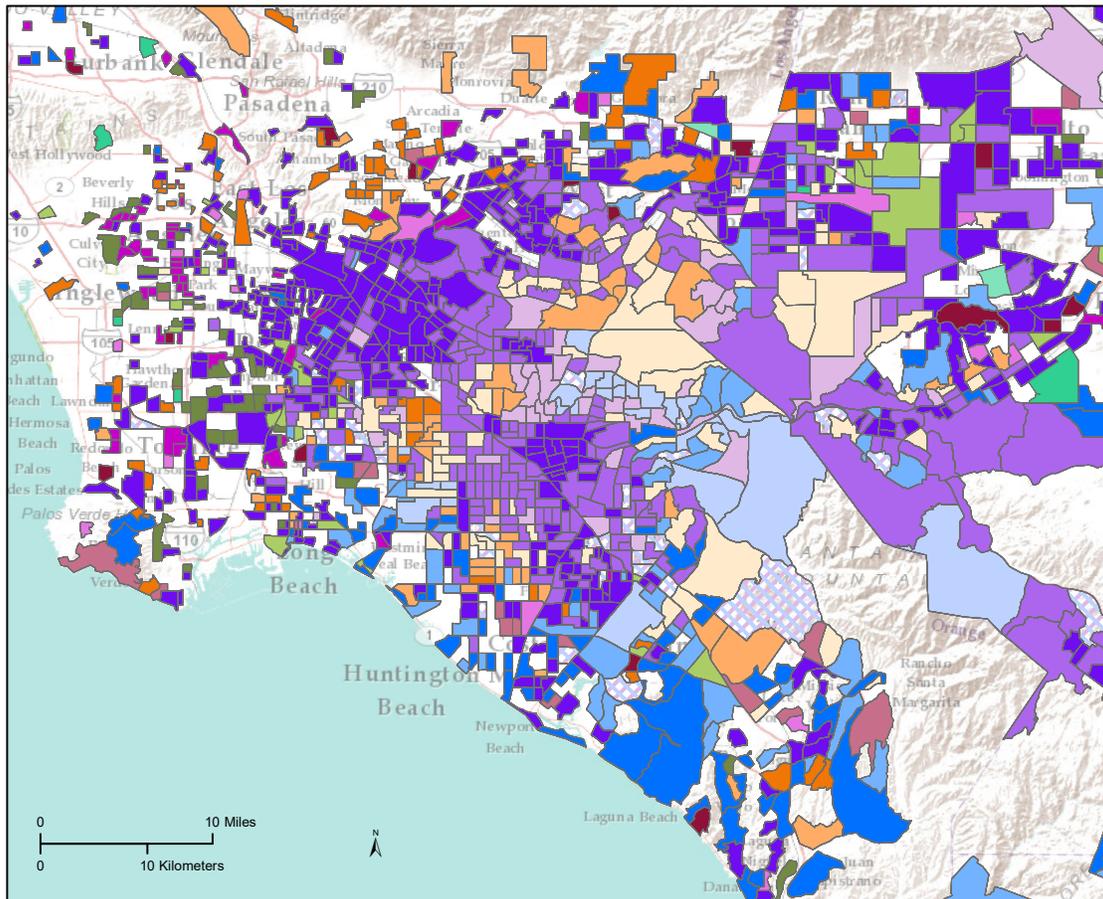
Race/Ethnicity/Gender - self-identification in registration form. Gender “n” means missing/unknown.
Age at the time of enrollment.

Financial Aid receiving any type of financial aid (amount awarded).

Economically Disadvantaged: Enrolled in Fullerton College during 2019-2020 or 2020-2021 academic year and had one of the following: a. Identified as a recipient of CA Promise Grant, Cal Grant, Pell Grant, Supplemental Educational Opportunity Grant (SEOG) during academic years 2019-2020 or 2020-2021 in NOCCCD; b. Identified as a recipient of CalWORKs, California Tribal Temporary Assistance for Needy Families (TANF) Program, Aid to Families with Dependent Children (AFDC) at any time in NOCCCD; c. Identified as a recipient of Supplemental Security Income program (SSI) at any time in NOCCCD; d. Identified as a recipient of a general assistance program (GA) at any time in NOCCCD; e. Identified as “Other” economically disadvantaged in VTEA survey at any time in NOCCCD; f. Received services through the community college’s CalWORKs program at any time in NOCCCD.

Demographics of Fullerton College Students

Visualizing the Ethnicity and Race of Students by Census Tract



3. DATA ANALYSIS & DISCUSSION

Food Deserts, US Department of Agriculture (USDA) Food Access Atlas Database

The United States Department of Agriculture maintains a public Atlas of Food Access ([USDA 2021](#)) that assembles over 280 pertinent food environment indicators and provides a spatial overview of a community's ability to access healthy foods. The year of the indicators vary to better accommodate data from a variety of sources, with the most recent county-level data used whenever possible. The atlas provides a comprehensive approach for exploring the complexities of food accessibility which may depend on several factors such as food prices, food and nutrition assistance programs, income, cars per household, and community characteristics. The USDA's interactive mapping feature allows users to visualize supermarket (defined as SNAP accepting food stores with all major food departments) accessibility based on distance of households from a supermarket, commonly categorizing households within more than a half mile from a supermarket as having limited access to fresh foods. But because distance alone provides a limited snapshot of neighborhood food access, the USDA's public geodatabase also provides other useful census tract level data variables on income and vehicle use (all data definitions available [here](#)) to gauge various degrees of food accessibility by considering the following variables:

- **Distance:** Census tracts farther than half a mile from a supermarket.
- **Low-income:** Census tracts with a poverty rate of 20 percent or greater; or with a median family income is less than or equal to 80 percent of the statewide median family income; or tract is in a metropolitan area and has a median family income less than or equal to 80 percent of the metropolitan area's median family income.
- **Low vehicle access:** Census tracts with at least 100 households that are more than one-half mile from the nearest supermarket and have no access to a vehicle; or at least 500 people or 33 percent of the population live more than 20 miles from the nearest supermarket, regardless of vehicle access.

Communities identified to have poor access to supermarkets are known as **food deserts**. Metrics that combine distance, income, and vehicle access help us identify the most acute forms of food deserts. The USDA categorizes low-income census tracts that are more than half mile from the nearest supermarket where more than 100 housing units do not have a vehicle as one of its most severe forms of deprivation in food access. Our analysis is focused on these critical geographies, detecting census tracts with the least food access by using combined metrics between distance, income, and access to a car.

It is important to note that many academic discussions have been dedicated to a critique of the term “food desert”. For example, the term pulls us away from the artificial and constructed nature of these geographies that are rooted in systematic racism in the form of zoning codes, lending practices, and other discriminatory policies. Using the term “desert” compares the lack of fresh and affordable food to a natural biome and obscures the history of deliberate discriminatory policies and systematic disinvestment of communities of color. Thus, the term “food apartheid” is often used to describe the resulting racialized access to fresh affordable foods nationwide. Even when compared

with communities with similar poverty rates, Latinx and Black neighborhoods have less access to fresh foods. Furthermore, access may not necessarily improve if new grocery stores open, especially if not affordable. As a result, many communities experience a “food mirage” where low-income and poverty limits access to fresh foods regardless of distance to supermarkets. Lastly, while a community’s access to fresh foods predictably runs along racial and income lines, the term “food deserts” implies that there is no food, and that is often not necessarily the case. Many times, poor people of color live in “food swamps”, or communities that have greater access to fast food³. Despite these important scholarly considerations, we utilize data and definitions by the USDA which describes these deprived communities as “food deserts”, so this term is therefore repeated here.

Approximately one quarter of Fullerton College students live in a food desert. Latinx, Black, economically disadvantaged, and first-generation students disproportionately lack access to fresh foods.

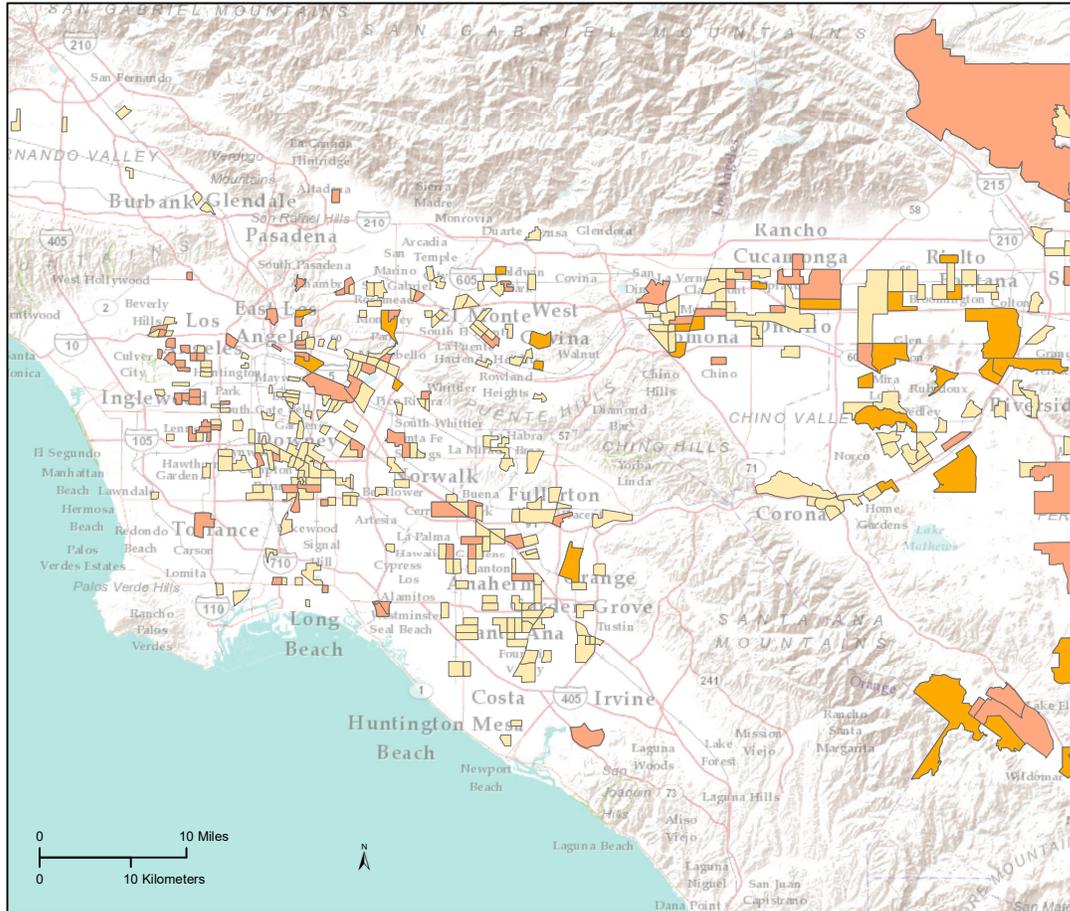
By USDA definitions, 24% (5,440) of FC students have inadequate access to fresh foods, living in neighborhoods that are both low-income and farther than a half a mile from a supermarket. Following national trends, Black and Latinx students are disproportionately represented in these food deserts. Furthermore, economically disadvantaged and first-generation students are also overrepresented in food deserts. More than one third of Fullerton College students living in food deserts do not receive financial aid.

low income, more than 1/2 mile from a supermarket	5440	24%
Low-income census tracts where a significant number or share of residents is more than 1/2 mile (urban) or 10 miles (rural) from the nearest supermarket.	FC students	of FC all students
demographic breakdown		
RACE & ETHN		
Asian	534	9.8%
Black	190	3.5%
Latinx	3776	69.4%
Native American/Pacific Islander	29	0.5%
Two or more	125	2.3%
Unrep	253	4.7%
White	533	9.8%
income		
Econ disadvantaged	5003	92.0%
Financial aid	3573	65.7%
First gen	2521	46.3%

³ “Food Apartheid: Racialized Access to Healthy Affordable Food”, 2021. Natural Resources Defense Council (NRDC) <https://www.nrdc.org/experts/nina-sevilla/food-apartheid-racialized-access-healthy-affordable-food>

Fullerton College Students and Food Deserts

Visualizing Food Access for Low Income Students



- Low-income census tracts where more than 100 housing units do not have a vehicle and are more than ½ mile from the nearest supermarket, or a significant number or share of residents are more than 20 miles from the nearest supermarket. Number of Fullerton College Students in these census tracts equals 1056 (5%).
- Low-income census tracts where a significant number or share of residents are more than 1 mile (urban) or 20 miles (rural) from the nearest supermarket. Number of Fullerton College Students in these census tracts equals 228 (1%).
- Low-income census tracts where a significant number or share of residents are more than ½ mile (urban) or 10 miles (rural) from the nearest supermarket. Number of Fullerton College Students in these census tracts equals 5440 (24%).

Data involves 6,724 out of 22,857
Fall 2019 Fullerton College Students
Projected With WGS 1984 UTM Zone 11N
Created By Joseph Diminutto
Created on 02/18/2022

*Note: There are duplicated counts of students as less severe metrics (such as low-income and farther than ½ mile) will include students that are in more critical measures (such as low-income, farther than ½ mile, without a car). In other words, these are not mutually exclusive and students are duplicated to illustrate the populations within each definition of a food desert.

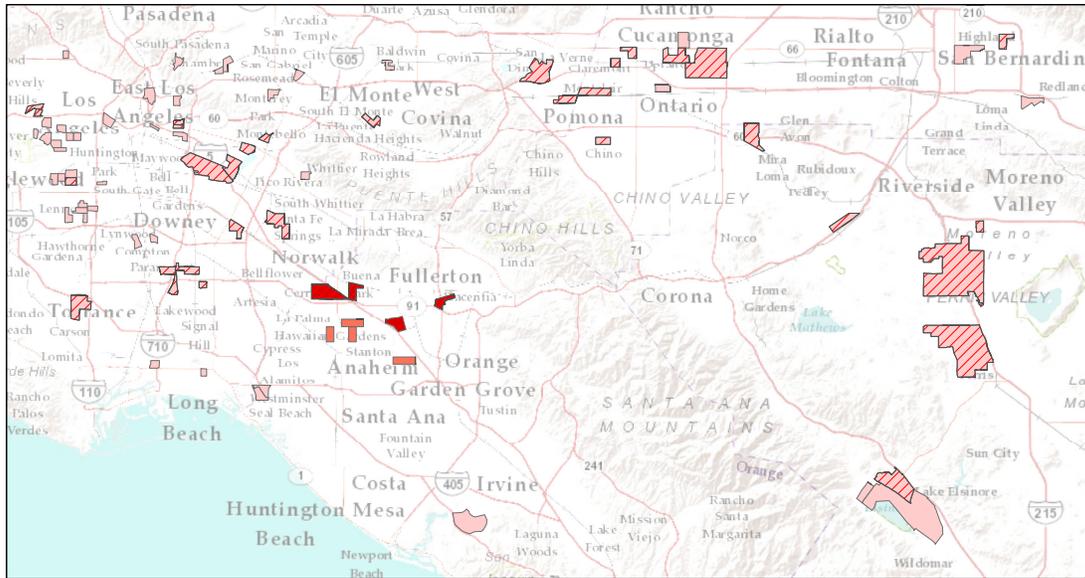
Black, Latinx, and low-income students are overrepresented in acute forms of food deserts, such as those living in low-income tracts with low vehicle access that are farther than ½ mile to a supermarket.

low income, more than one mile from a supermarket	228		1%
Low-income census tracts where a significant number or share of residents is more than 1 mile (urban) or 20 miles (rural) from the nearest supermarket.	FC students		of all FC students
demographic breakdown			
RACE & ETHN			
Asian	21		9.0%
Black	33	5x	15.0%
Latinx	131		57.0%
Native American	1		less than 1%
Two or more	6		3.0%
Unrep	16		7.0%
White	20		9.0%
Income			
Econ disadvantaged	211		92.5%
Financial aid	160		70.2%
First gen	102		44.7%
low income, low access to markets and vehicle	1056		5%
Low-income census tract where more than 100 housing units do not have a vehicle and are more than ½ mile from the nearest supermarket, or a significant number or share of residents are more than 20 miles from the nearest supermarket.	FC students		of all FC students
demographic breakdown			
	n		%
RACE & ETHN			
Asian	100		9%
Black	64	2x	6%
Latinx	701		66%
Native American	2		less than 1%
Two or more	25		2%
Unrep	67		6%
White	97		9%
Income			
Econ disadvantaged	980		92.8%
Financial aid	714		67.6%
First gen	496		47.0%

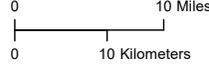
Note: 6% of students in Low-Income, Low-Vehicle Access (LILA) census tracts are Black students. This share represents twice the share of the Black FC student population. Note: 15% of students in low income census tracts farther than one mile from a supermarket are Black students. This share is equals to five times the share of the FC Black student population.

Fullerton College Students and Food Deserts

Measured Against Census Tracts With Low Income and Low Access to Markets and Vehicles in Southern California



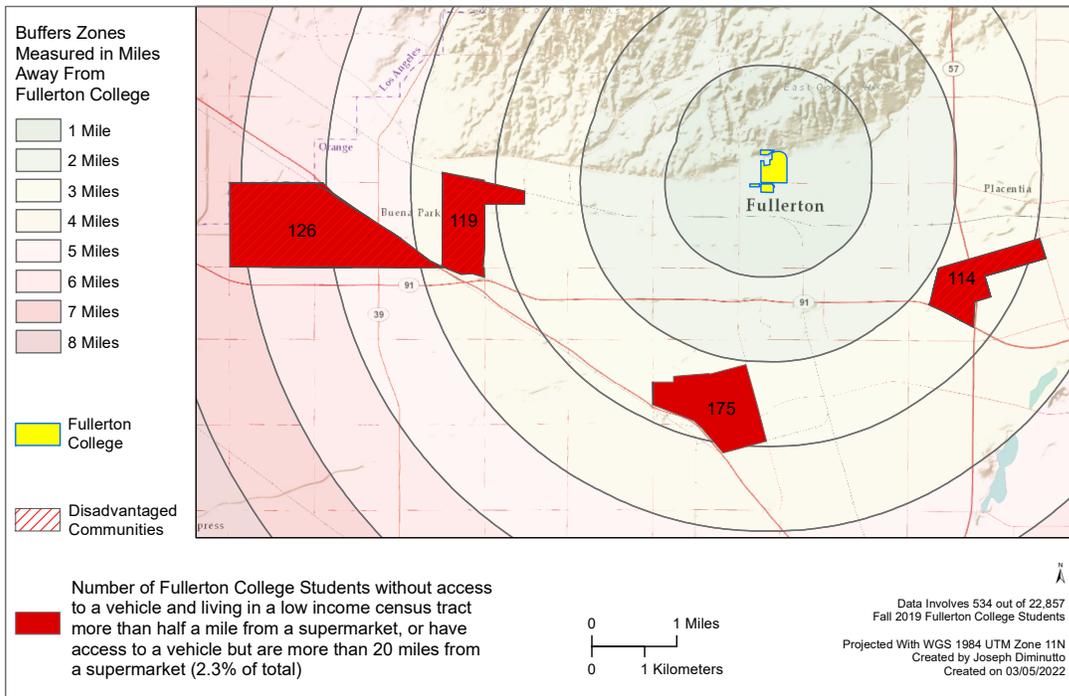
Students without access to a vehicle and living in a low income census tract more than half a mile from a supermarket, or have access to a vehicle but are more than 20 miles from a supermarket (5% of total)



Data Involves 1,056 out of 22,857 Fall 2019 Fullerton College Students
Projected With WGS 1984 UTM Zone 11N
Created by Joseph Diminutto
Created on 02/18/2022

Fullerton College Students and Food Deserts

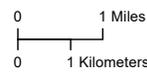
Distance of Census Tracts From Fullerton College Containing Large Amounts of Low Income Students That Have Low Access to Markets and Vehicles in Southern California



Buffers Zones Measured in Miles Away From Fullerton College



Number of Fullerton College Students without access to a vehicle and living in a low income census tract more than half a mile from a supermarket, or have access to a vehicle but are more than 20 miles from a supermarket (2.3% of total)



Data Involves 534 out of 22,857 Fall 2019 Fullerton College Students
Projected With WGS 1984 UTM Zone 11N
Created by Joseph Diminutto
Created on 03/05/2022

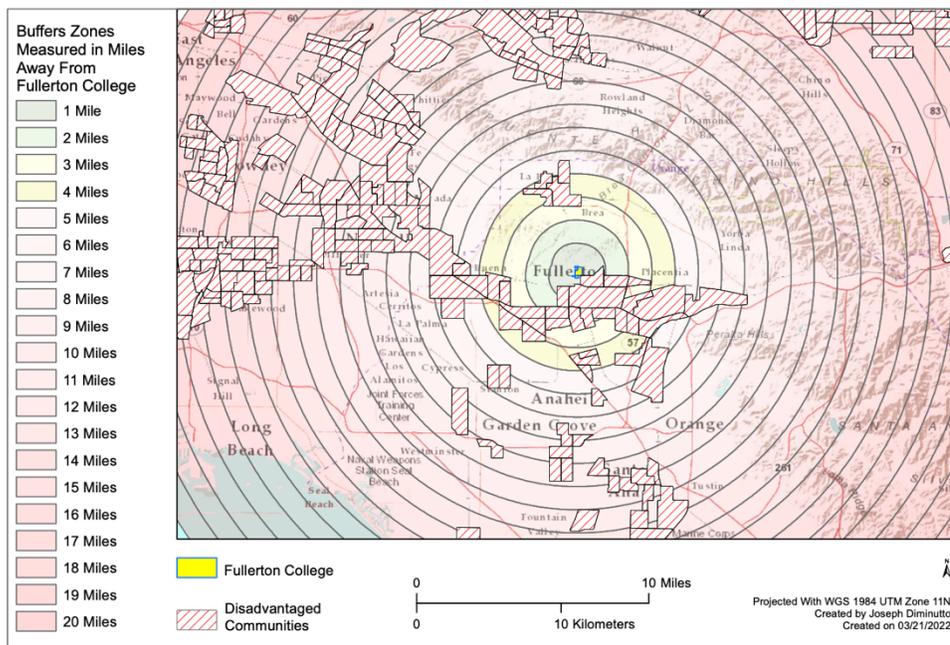
With reference to Fullerton College, the maps above identify nearby (1-6mi from FC) low-income student neighborhoods that are far from a supermarket and with low access to a car (low-income-low access: LILA). These are identified as follows:

- **South Placentia LILA Census Tract** [S of Orangethorpe, W of the I-57, N of CA-91]: **114 students** living approximately 3.6 miles, 51-minute walk to FC.
*This neighborhood is off the bus routes, resulting in a one-hour commute by bus.
- **Anaheim LILA Census Tract** [Harbor S, East of I-5, S of La Palma]: **175 students** living approximately 2.7 miles, 55-minute walk, from FC
- **Buena Park LILA Census Tract** [W of I-5, N of CA-91], **126 students** living in approximately 6 miles, 2hr-walk, from FC
- **West Fullerton/Buena Park LILA Census Tract** [E of I-5, N of CA-91], **119 students** living approximately 4.7 miles, 1hr-30minute-walk, from FC

These four census tracts are home to a total of 534 students who are critically disadvantaged in food accessibility by geography. These tracts are acute types of food deserts, and, with the exception of the Anaheim LILA Census Tract, recognized by the state of California as disadvantaged communities (having an median household income 80% below the median household income for the state of California). While the map above only includes critical food deserts, geographical planning would also help students in low-income neighborhoods and other disadvantaged communities who are not in food deserts but may have difficulties in getting to campus. Planning for access to campus from state defined disadvantaged neighborhoods is paramount to bridge that 3-to-6-mile distance between students and campus resources. The map below illustrates disadvantaged communities in relation to the college campus.

Spatiality of Disadvantaged Communities and Fullerton College

Distance of Economically Disadvantaged Census Tracts From Fullerton College



Food Deserts and Food Insecurity at Fullerton College

The Real College Survey (2021), which included participation of nearly 195,000 students in 202 colleges and universities in 42 states, communicates that 39% of college students are food insecure. The survey captured 1,789 Fullerton College students amidst the context of the COVID-19 pandemic: 40% reported to have experienced food insecurity—almost half of these experiencing high levels of food insecurity, worrying about running out of food before having money to buy more. Basic needs insecurity is prevalent in two-year colleges, especially impacting marginalized populations. The report’s findings point to an urgent “basic needs centered approach” as more than half of students systemwide are not getting help^{4 5}.

The Real College Survey is based on survey participation of a share of the FC student population, not the geographical contexts of the FC student population. The Real College Survey report does not account for the persistent geographical patterns of disadvantage and how food deserts pose an additional obstacle to food access. The context of FC students in food deserts is another way to gauge how students face food insecurity. Not all students who are food insecure live in food deserts, but living in a food desert adds further obstacles to food security, especially when food deserts are defined combining income, distance, and car access, as done in this project.

The Real College Survey also communicates that students are not accessing on-campus support, but there is no mention to the impacts of physical isolation in accessing campus resources students may have been utilizing prior to the pandemic, such as the Food Bank. The food deserts mapped in this project were pre-pandemic, and it’s difficult to overstate how COVID-19 may have made food access more difficult. Remote learning resulted in drops in the OCTA free ride program and the physical accessibility to on-campus resources. The pandemic disrupted the national economy, further intensifying the situation of struggling households *and* most likely further isolating students living in critical food deserts. Especially for the 1,056 students in low-income food deserts without a car, the pandemic further cut access to the much-needed food provided at Fullerton College via the Food Bank and Food Drive Thru. As the college plans to return greater shares of its students to campus, it is important to plan for better access of disadvantaged students living in isolated tracts without a car.

Green Spaces, California Parks and Recreation Data

California Parks and Recreation published the latest park accessibility data ([California State Parks, 2020](#)) using 2010-2020 neighborhood level datasets. Parks are public open spaces with open public access delineated based on the California Protected Areas Database (CPAD), a GIS dataset mapping a wide diversity of parks and open spaces in California, ranging from large national forests & parks to neighborhood parks. Parks, as

⁴ Survey Inquiry Group, Summer 2021. Reports available via request to Fullerton College’s Office of Institutional Research and Effectiveness.

⁵ Real College 2021: Basic Needs Insecurity During the Ongoing Pandemic https://hope4college.com/wp-content/uploads/2021/03/RCSurvey_NatOnePager_FINAL_3.22.2021.pdf

delineated and defined by CPAD, are often used to understand the distribution of public green spaces, but many parks/open spaces are areas that may not necessarily include much greenery – for that reason, many in-depth analyses of green spaces may also survey the *quality* of parks for the purposes of access to greenery and recreational amenities.

For the purposes of this study, we applied the metrics provided by the California Parks and Recreation to gauge neighborhood-level green space accessibility based on two common methods: 1) neighborhoods over a half a mile away from a public park/open space and 2) percentage of population with less than 1 park/open space acres⁶ per 1,000 residents. **Park Poor** refers to census tracts with inadequate access to parks by distance and by relative acreage. The National Recreation and Parks Association has recommended ten acres of park space per 1,000 residents and park access within a walking distance of a half a mile or less. Our study focused on critical geographies, mapping students that live in neighborhoods with less than 1 acre of parks per 1,000 residents, a relative acreage well below what is recommended.

For context, 61% of Californians live in areas with less than three acres of parks per 1,000 residents and 21% live farther than ½ mile from a park. While a greater share Orange County residents live closer to parks (with 11% farther than a half a mile), the county has less park acreage per 1,000 residents than state patterns as 64% of OC residents live in census tracts with less than 3 acres of parks/open space per 1,000 residents. Residents in Los Angeles have less access to green spaces - 18% live farther than ½ mile from a park and 79% live with less than 3 acres per 1,000 residents. The breakdown of cities where FC students live and city-level park access is as follows:

⁶ Three acres is approximately one and a half soccer fields.

Top cities where FC students live	2019 FC Student Population	% of total FC Student Population	% of residents further than half mile from a park	% of residents with less than 1 acres p/ 1,000 residents	
Anaheim	5576	24.40%	14%	59%	
Fullerton	3816	16.70%	5%	50%	
La Habra	1676	7.33%	3%	68%	
Whittier	1302	5.70%	7%	53%	
Placentia	1033	4.52%	2%	81%	
Buena Park	955	4.18%	20%	75%	
Brea	929	4.06%	16%	34%	
TOTAL	15287	66.88%			
Cities with less access to green spaces					
Stanton	148		10%	96%	
Diamond Bar	161		13%	93%	
Santa Ana	281		28%	92%	
Corona	252		1%	91%	
Garden Grove	437		11%	90%	
Orange	436		26%	69%	
Norwalk	248		24%	69%	
Los Angeles	179		19%	67%	
Cypress	161		30%	61%	
TOTAL	2303	10.08%			
FC Students by county	16914	74%	11%	64%	OC FIGURES
	4571	20%	18%	79%	LA FIGURES
COUNTIES					
TOTAL	21485	94%			

GREEN CITY INDEX: California Cities & Green Spaces			
Ranked cities where FC students live	City total green area	People living within 10-min walk to a green space	Ranking to comparable cities
Anaheim	20%	0.7%	42 out of 50
Fullerton	15%	1.4%	219 out of 225
Placentia	29.90%	0.1%	131 out of 184
Buena Park	3.87%	0.3%	156 to 184
Orange	19.11%	1.2%	208 out of 225
Los Angeles	28%	0.4%	7 out of 10
MEDIAN	54.15%	0.9%	

The table above lists cities with large populations of Fullerton College students and their ranking according to the Green City Index. This index ranks cities based on 1) total area and % of city area, 2) green space area available per person, 3) percentage of residents in a 10-minute walking distance to a green space. As can be noted, the amount of green space in these cities is well below the national median, with Buena Park and Fullerton having little percentage acreage dedicated to green spaces in relation to other American cities. Furthermore, many cities where FC students live rank low in green space accessibility.⁷

⁷ The Green City Index. https://interiorbeat.com/green-city-index/?city_id=New_York-NY. *Private green spaces are considered green spaces in this index.

Green Space Access and Fullerton College Students

Spending time in green spaces improves mental health and wellbeing⁸. The total amount of vegetated spaces in a city also contribute to various ecosystem services that reduce air pollution, sound pollution, providing shade and cooling, groundwater replenishment and supporting wildlife habitat and pollination, for example. These essential services are compromised when the urban landscape is largely paved. As climate change exacerbates droughts in Southern California, for example, the rainwater lost to urban run-off from paved surfaces compromises aquifer replenishment and our ability to rely on these reservoirs when rain is scarce.

Climate change is also increasing the frequency, duration, and intensity of extreme heat waves. Urban design can exacerbate or alleviate heat wave effects and how communities are able to cope. While most are familiar with the term “heat islands”, used describe how paved urban spaces absorb solar radiation and experience hotter temperatures, it is less known that cities are more like a diverse archipelago with varying degrees of experience with heatwaves. In other words, temperature data at the city level can be quite deceiving, as a record-breaking hot day is experienced very differently by city block. For example, Los Angeles as a city might experience an average temperature of 100°F on a hot day, but some neighborhoods on that same day could be 5.5°F cooler while others be 2.1°F hotter. The difference is attributable to the presence or lack of canopy cover and vegetated spaces. The acreage of green spaces and the density of tree cover varies substantially by city block causing substantial “thermal inequities”⁹. These inequities vary along income and ethnoracial lines, with low-income neighborhoods and neighborhoods of communities of color having the least canopy cover. This reality is rooted in a history of racist housing policies and the systemic divestment of communities of color. A study⁷ surveying over 100 American cities found that previously redlined cities, many of which remain largely segregated, have less canopy cover and therefore higher temperatures. Thus, people living in these neighborhoods, largely low-income communities of color, are at greater risk of having lethal experiences with heat, one of the deadliest consequences of climate change¹⁰.

⁸ “Green Spaces Aren’t Just for Nature – They Boost Our Mental Health Too” in *New Scientist*, 2021. <https://www.newscientist.com/article/mg24933270-800-green-spaces-arent-just-for-nature-they-boost-our-mental-health-too/>

⁹ “How Decades of Racist Housing Policies Left Neighborhoods Sweltering,” in *The New York Times* 2020. <https://www.nytimes.com/interactive/2020/08/24/climate/racism-redlining-cities-global-warming.html> and “The Effects of Historical Housing Policies on Resident Exposure to Intra-Urban Heat: A Study of 108 US Urban Areas” in *Climate*, 2020. <https://www.mdpi.com/2225-1154/8/1/12/html>

¹⁰ “Heat Waves Kill People – And Climate Change is Making It Much Worse,” in *National Geographic*, 2020. <https://www.nationalgeographic.com/environment/article/heat-related-deaths-attributed-to-climate-change> and in “The Burden of Heat Mortality Attributable to Recent Human-Induced Climate Change,” in *Nature Climate Change*, 2021. https://www.nature.com/articles/s41558-021-01058-x.epdf?sharing_token=INF2iv2VKN9wbVxOpziCENRgN0jAjWel9jnR3ZoTv0N74knunZjp4k1Ncyycvvs4s-boSk4oaOLQNv21uGPfVphFzh-SxyLsR586eG5Mb_qdzIMZA35OeFPBc8nAhKzHHmmiNATkeEX2KZMVJM5jV05IzFYRWIJKbFCJTkkKX0qsdaG7pdnbjSghjWptvN3AgInj2ovW6tbIuyby_hqICeYRTm1KJJo7bzNsgCbyb_0%3D&tracking_referrer=www.nationalgeographic.com

What does all of this mean for Fullerton College students? Studies have found that school lots, often poorly vegetated and heavily paved, are their own kind of heat islands¹¹. At Fullerton College, the 2020 Facilities Masterplan lists the “lack of shade and comfortable outdoor spaces” as one of the existing campus challenges. An analysis of the campus thermal comfort zones suggested a potential for shaded pedestrian pathways.¹² As urban heat increases, tree cover is a main strategy to alleviate heat for students and save energy. The campus quad is a likely refuge to countless FC students who migrate from neighborhoods without access to greenery.

About 12% of FC students live farther than half a mile from a green space and 50% live in neighborhoods with less than 1 acre of green space per 1,000 residents. 1,900 students live in both predicaments – in neighborhoods that have are both far from a park and have a high density per available greenspace. Latinx & economically disadvantaged students disproportionately lack access to green spaces. To a less extent, Black students are also disproportionately impacted.

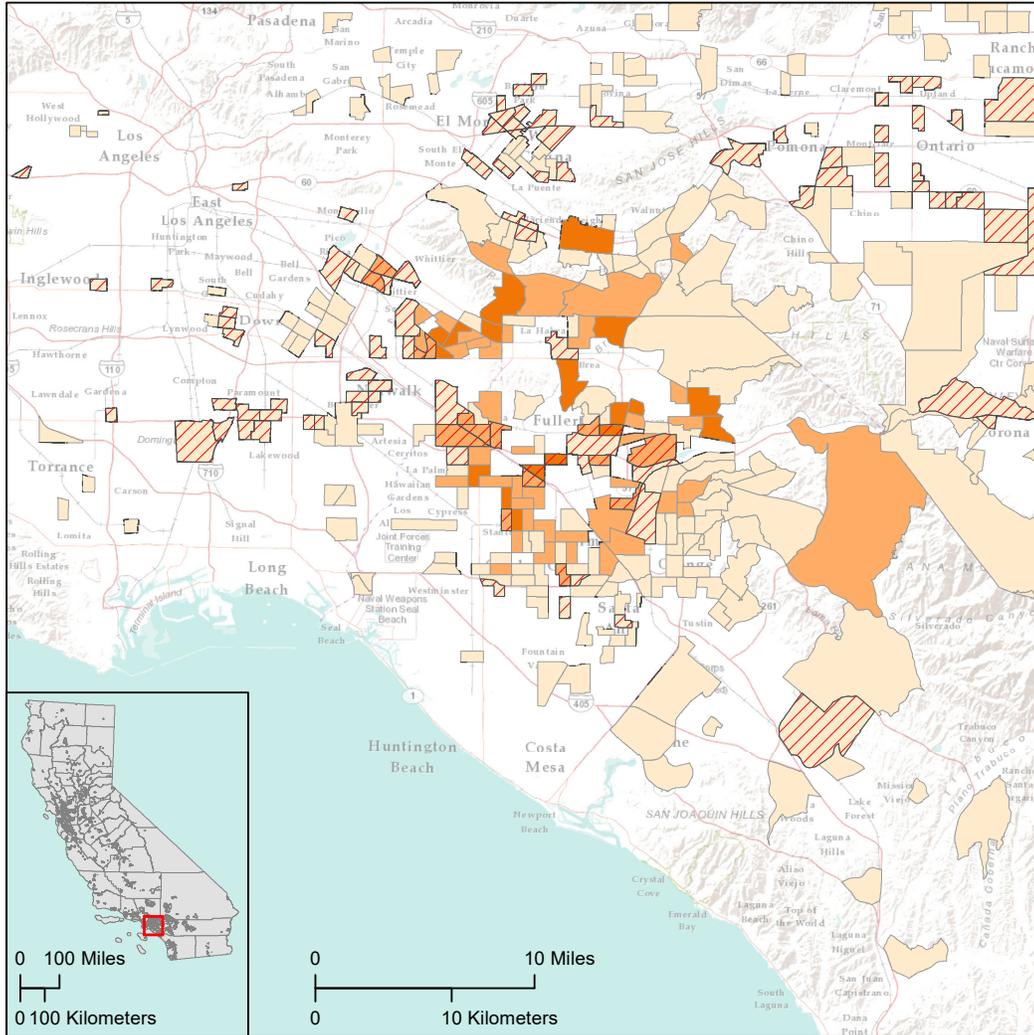
Students in Census tracts further than 1/2 mile from a	2798	12.2%
demographic breakdown		
RACE & ETHN		
Asian	363	13%
Black	83	3%
Latinx	1664	59%
Native American/Pacific Islander	18	1%
Two or more	103	4%
Unrep	99	4%
White	468	17%
income		
Econ disadvantaged	2358	84.3%
Financial aid	1628	58.2%
First gen	1000	35.7%
residents living within less than 3 acres of parks per 1,000 residents	11538	50.5%
demographic breakdown		
RACE & ETHN		
Asian	1315	11.4%
Black	345	3.0%
Latinx	7278	63.1%
Native American/Pacific Islander	52	0.5%
Two or more	344	3.0%
Unrep	532	4.6%
White	1672	14.5%
income		
Econ disadvantaged	10041	87.0%
Financial aid	6883	59.7%
First gen	4539	39.3%

¹¹ “Enhancing Schoolyard Resilience to Extreme Heat: Evaluating Pre Intervention Thermal Environments” by Mary Rogers, UCLA in *Climate Adaptation Symposium*, 2021. UCLA Luskin Center for Innovation. <https://www.youtube.com/watch?v=e93vesdWKW0>

¹² Fullerton College Facilities Masterplan, 2020. https://www.nocccd.edu/files/nocccd_fullerton_booklet_76246.pdf

Fullerton College Students' Proximity to Green Spaces

Measured Against Parks and Open Spaces Farther Than a Half Mile in Southern California



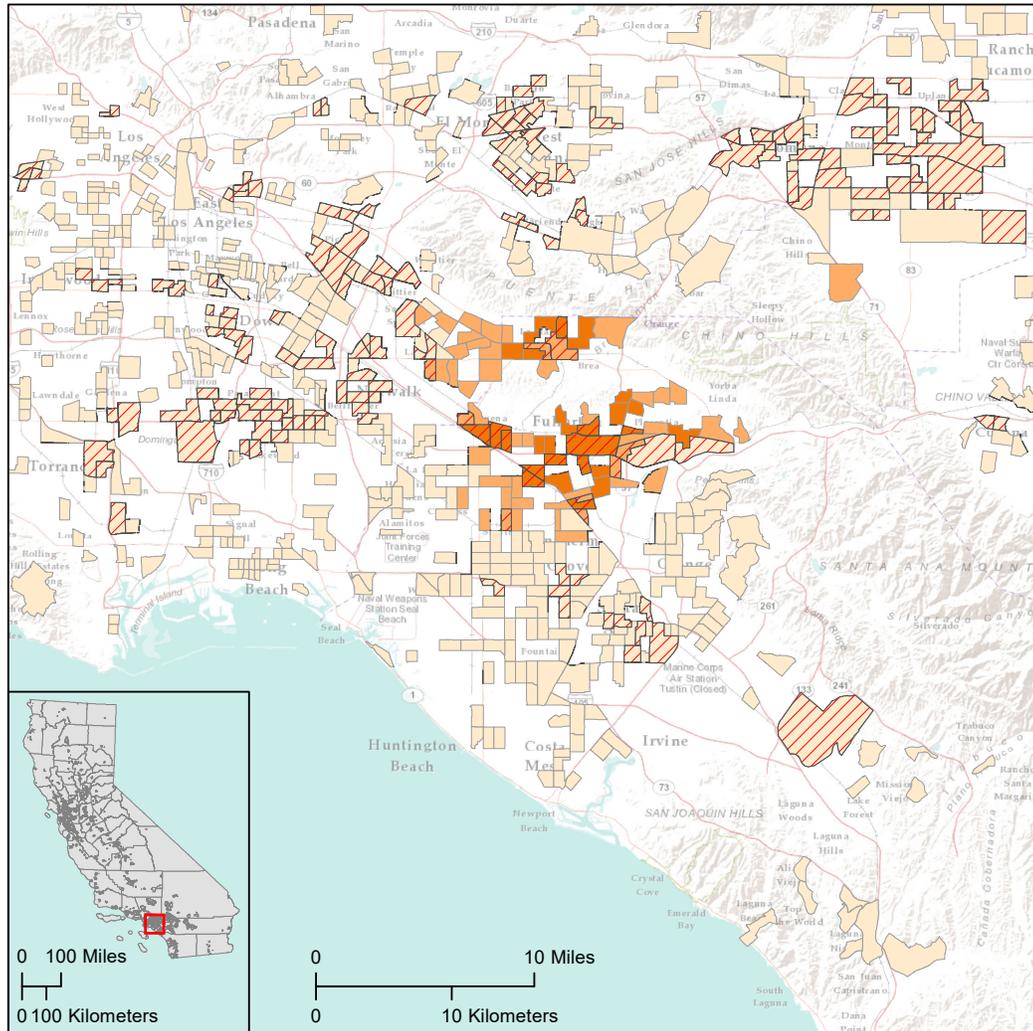
Students Located Farther Than a Half Mile From Parks and Open Spaces (12% of Total)



Data Involves 2,798 out of 22,857
 Fall 2019 Fullerton College Students
 Projected With WGS 1984 UTM Zone 11N
 Created by Joseph Diminutto
 Created on 02/18/2022

Fullerton College Students' Proximity to Green Spaces

Measured Against Parks and Opens Acreages per 1,000 Residents Within Southern California



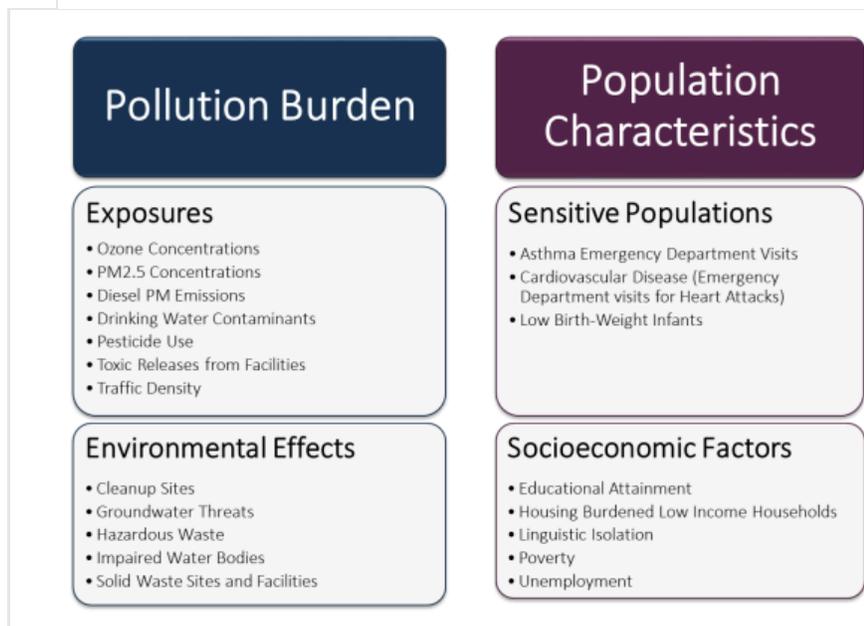
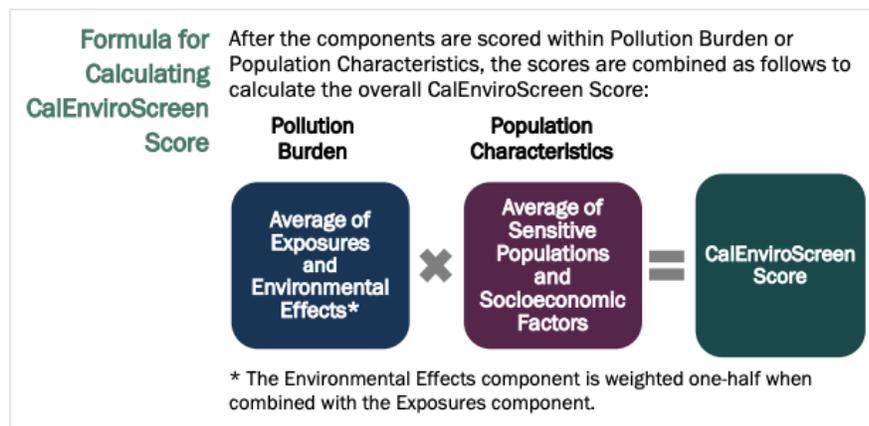
Students in Census Tracts With Less Than 1 Park Acre per 1,000 Residents (50% of Total)

- 1 - 40
- 41 - 120
- 121 - 240
- Disadvantaged Communities

Data Involves 11,538 out of 22,857
Fall 2019 Fullerton College Students
Projected With WGS 1984 UTM Zone 11N
Created by Joseph Diminutto
Created on 02/18/2022

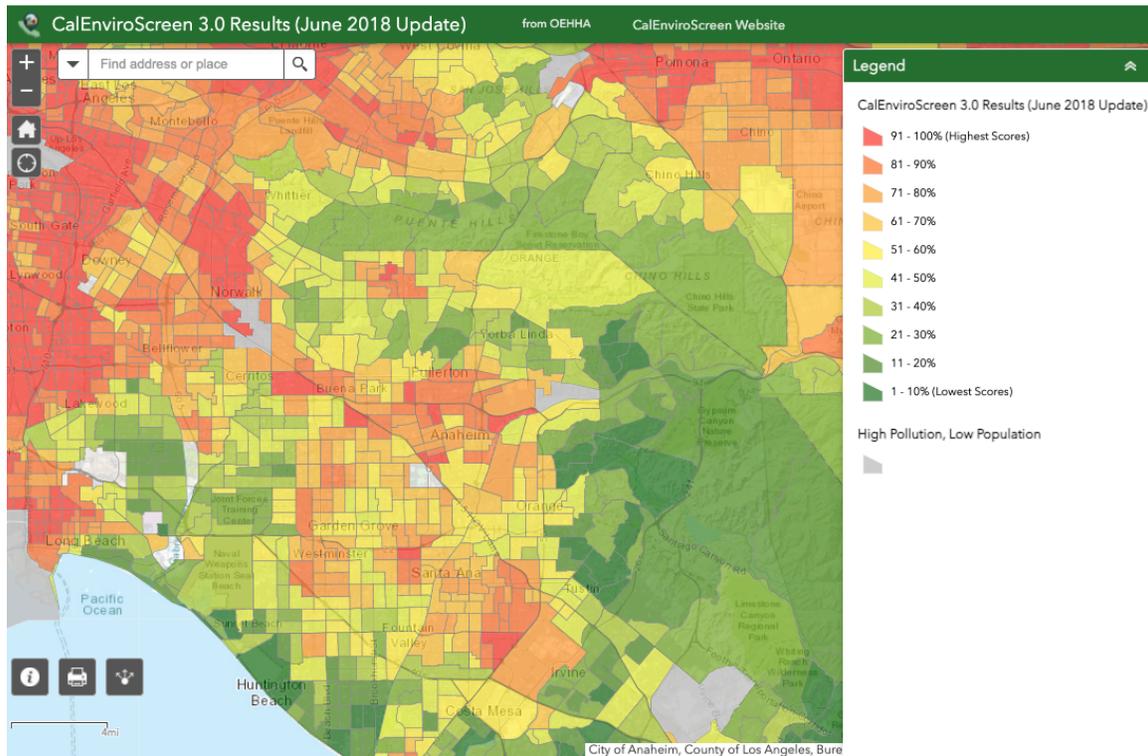
California EnviroScreen 3.0, Environmental Health Hazard Assessment (OEHHA, California Environmental Protection Agency)

The Office of Environmental Health Hazard Assessment, from California’s Environmental Protection Agency, monitors environmental quality across the state via the CalEnviroScreen, a multi-indicator screening tool that identifies concentrations of pollutants and the potential vulnerability of a census tract population to pollution based on environmental, socioeconomic, and health data. The combination of such indicators results in a numerical score for each mapped census tract in California measuring relative pollution burdens and vulnerabilities. Census tracts with darker red colors have the higher CalEnviroScreen scores and therefore have relatively high pollution burdens and population vulnerability – they are symbolized by percentiles. Census tracts with lighter green colors have lower scores, and correspondingly lower pollution burdens and sensitivities (CalEnviroScreen 3.0, 2018)¹³.



¹³ Individual and combined indicators map <https://arcg.is/0fiyby>

See the So Cal EnviroScreen 3.0 map¹⁴ below.



43% of students live in census tracts susceptible to high pollution burden and vulnerability, with Black and Latinx students disproportionately impacted. 42% of Black students live in neighborhoods most greatly impacted by pollution.

Given the complexity of the California Enviro Screen Index and the need for updated datasets, we do not provide our own maps for this metric. Recent scores of the EnviroScreen were released in late 2021, with new metrics and methodology considerations for a EnviroScreen 4.0. However, a quick glimpse of our FC student population in relation to the 2018 version of this multi-indicator metric (EnviroScreen 3.0) shows that 43% of Fullerton College students (9,849) live in census tracts coded in the highest percentiles of pollution (71st percentile and above), based on environmental

¹⁴ Detailed methodological notes EnviroScreen 3.0 (OEHHA): The overall CalEnviroScreen score is calculated by multiplying the Pollution Burden and Population Characteristics scores. Since each group has a maximum score of 10, the maximum CalEnviroScreen Score is 100. The geographic areas are ordered from highest to lowest, based on their overall score. A percentile for the overall score is then calculated from the ordered values. As for individual indicators, a geographic area's overall CalEnviroScreen percentile equals the percentage of all ordered CalEnviroScreen scores that fall below the score for that area. Maps are developed showing the percentiles for all the census tracts of the state. Maps are also developed highlighting the census tracts scoring the highest. Census tracts with darker red colors have the higher CalEnviroScreen scores and therefore have relatively high pollution burdens and population sensitivities. Census tracts with lighter green colors have lower scores, and correspondingly lower pollution burdens and sensitivities ([CalEnviroScreen 3.0, 2017](#)).

exposures and demographic vulnerabilities of their neighborhoods. Another important data highlight is that 274 Black students live in these neighborhoods, and that accounts for 42% of the FC Black student population. Furthermore, 1,285 students live in neighborhoods identified to be among the most toxic in the state (91st percentile and above) - both Latinx and Black students are overrepresented in those tracts. In other words, our Black and Latinx students are carrying the burden of pollution of their neighborhoods disproportionately in comparison to other FC students.

RACE/ETHNICITY	NUMBER OF FALL 2019 FC STUDENTS WITHIN CES SCORE RANGES			Total within CES ranges
	71% - 80%	81% - 90%	>= 91%	
CES SCORE RANGES	71% - 80%	81% - 90%	>= 91%	
Asian	477	310	104	891
Black	124	96	54	274
Latinx/Hispanic	3087	2993	979	7059
Native American	12	10	3	25
Pacific Islander	19	8	1	28
Two or more races	142	66	16	224
Unreported	195	183	64	442
White	563	279	64	906
TOTAL	4619	3945	1285	9849
	46.90%	40.50%	13.05%	
Representation of Student Population in these communities				
Asian	10.3%	7.9%	8.1%	9%
Black	2.7%	2.4%	4.2%	3%
Latinx/Hispanic	66.8%	75.9%	76.2%	72%
Native American	0.3%	0.3%	0.2%	0%
Pacific Islander	0.4%	0.2%	0.1%	0%
Two or more races	3.1%	1.7%	1.2%	2%
Unreported	4.2%	4.6%	5.0%	4%
White	12.2%	7.1%	5.0%	9%
TOTAL	100.0%	100.0%	100.0%	100%

59% of economically disadvantaged first-generation students live in census tracts susceptible to the highest levels of pollution burden, especially Latinx students.

Of all students within critical geographies detected by the EnviroScreen, 91% (8,976) are economically disadvantaged and 59% (4,308) of students who are both economically disadvantaged and first-generation live in neighborhoods with grave levels of pollution burdens (71st percentile and above). The majority (84%) of them are Latinx students.

Economically Disadvantaged Students (CCC Perkins) and Disadvantaged Communities (State of California)

Food deserts and park poor census tracts encompass most of our economically disadvantaged students, disproportionately Black and Latinx. 92% of first-generation students are economically disadvantaged.

A key observation of this analysis is how the CCC marker for “economically disadvantaged” (see pg.5) students detects, to a large extent, the student populations susceptible to the geographical vulnerabilities gauged in this study. Students identified as economically disadvantaged represent about 84% of Fullerton College students but about 92% of students living in food deserts. Similarly, about 86% of students living in park poor tracts are also students identified as economically disadvantaged by the CCC-system. While Black and Latinx students are slightly overrepresented in this designation, it is first-generation students that stand out: First generation students (7,945) consist 35% of the FC student population and 92% of them (7342) are economically disadvantaged. Thus, first generation students are susceptible to layers of environmental deprivation.

One third of economically disadvantaged students do not receive financial aid.

Financial Aid helps 66% of students (n 4,000) in state defined disadvantaged communities. Nonetheless, a key observation is that one third (6,459) of students who are economically disadvantaged, and thus much more likely to live in these critical geographies, are not receiving financial aid. Economically disadvantaged Asian students are disproportionately impacted (see table on pg. 5). Additionally, out of the students who live in state defined disadvantaged communities, financial aid does not support 33% of them. In either measure, financial aid misses about one-third of students in need. This figure is alarming, especially considering the geographical disadvantages described here plus the additional burden of paying for school without help.

About 27% of FC students live in a state-defined disadvantaged neighborhoods, or census tracts with median household income (MHHI) 80% below the MHHI of the state of California. More than one third of these students do not receive financial aid.

Disadvantaged Communities: Census block-groups with a Median HouseHold Income (MHHI) less than 80% of the California MHHI. The threshold is derived from American Community Survey 5-year estimates at the block-group geographic level, per the California Public Resources Code (PRC), Section 75005(g).	6077	27%
RACE & ETHN		
Asian	459	7.6%
Black	144	2.4%
Latinx	4615	75.9%
Native American/Pacific Islander	33	0.5%
Two or more	123	2.0%
Unrep	237	3.9%
White	466	7.7%
income		100.0%
Econ disadvantaged	5608	92.3%
Financial aid	4000	65.8%
First gen	2894	47.6%

6,077 Fullerton College students live in neighborhoods that are defined by the state of California as disadvantaged neighborhoods, or census tracts with a median household income (MHHI) that is below 80% the median MHHI of the state of California (2014-2018). Latinx students are notably overrepresented in state disadvantaged communities, and these neighborhoods contain 92% of our economically disadvantaged students and half of our first-generation students. 34.2% of students in these communities do not receive financial aid.

4. CONCLUSIONS AND PLANNING RECOMMENDATIONS

Thousands of students at Fullerton College are environmentally disadvantaged: 5,440 live in a food desert, 12,436 are park poor, and 9,849 are overburdened by environmental pollution. By geography, these students lack access to essential resources such as nutritional foods, green spaces, and clean environments.

Black and Latinx students are disproportionately impacted by environmental disadvantages along with economically disadvantaged and first-generation students. It is very likely that many students are subjected to intersections of disadvantage: for example, students who are economically disadvantaged, first-gen, and BIPOC who may live in state defined disadvantaged neighborhoods that are also food deserts, park poor, and burdened by pollution (or some variation of these intersecting attributes). These intersections were minimally explored in this project but likely impose compounded burden on many students.

First-generation students experience intersectional disadvantages. While first-generation students account for 35% of the student population, 92% of them are economically disadvantaged. Our economically disadvantaged first-gen students are predominantly Latinx (80%). They are consistently overrepresented in geographies of disadvantage, living in low-income census tracts with low access to fresh foods, green spaces, and burdened by pollution – all while pioneering a college education for the first time in their family. More than a third of them are not receiving financial aid.

The California Community College’s Perkins definition of “economically disadvantaged” shows to be inclusive of geographical disadvantages, as economically disadvantaged students identified by this definition are consistently overrepresented in the critical geographies described here. One third of these students do not receive financial aid.

Remote learning limits students' access to the physical environment of Fullerton College and limits the ability of the college to mitigate environmental inequities explored in this research project. Spatial design and physical functions can help mitigate disadvantageous geographical contexts that many of our students migrate from. Certain college services can only be accessed physically, such as the food bank, food drive thru, and even access to hydration stations and green spaces on campus.

The college experience is a migration through space and time, where students make leaps of generations but also of geographies – many times of both. This fact makes colleges hopeful spaces with great potential for access, self-realization, and transformation. Connecting needy students to physical campus spaces that promote their wellbeing is essential to promote student success.

RECOMMENDATIONS:

While advancing environmental justice must be a multi-scale commitment of public decision-making bodies, educational institutions are uniquely positioned to help bridge geographies of disadvantage as thousands of students migrate to campus spaces and can be connected to important resources. In order to maximize this potential, campus leaders can consider the environmental disadvantages explored in this report as an equity priority. Based on the findings of this study, we hereby offer several action items that can help increase student access to essential resources and help reduce environmental inequities:

- 1) Mobile-compatible interactive maps:** Interactive maps are common in college campuses, but Fullerton College lacks a mobile-web interactive map that connects students to important resources on campus. Interactive maps help students connect information to location and more easily access campus services and physical spaces. Mapping layers can be selected to identify the food bank, campus gardens, hydration stations, mental health support, tech support, conference/study spaces, and etc. Informative and dynamic maps help students easily find what they need while on campus as well as important associated information such as operational hours, contact persons, for example. Interactive maps can also be used as educational tools, helping students locate culturally/ecologically important trees or art on campus, along with other campus features.
- 2) Public transportation and bike routes to campus:** The college currently does not have an interactive map advertising how to get to campus. Hundreds of students living in low-income/disadvantaged neighborhoods could benefit from explicit and mobile compatible maps with bus and bike routes to campus and associated travel times. Focused mapping targeting the routes from low-income neighborhoods to campus with emphasis on a “free ride” could help make students more familiar with the OCTA bus pass program and their options for campus access. Itineraries like “ride at this time” and “visit the Food Bank at this time” could also help with the logistics of campus hours.
- 3) Geographically targeted “care mail”:** Campus administration could target mailing packages to students that are both economically disadvantaged and without financial aid. The findings of the Survey Inquiry Group and The Real College Survey indicate that the most common reason why students do not apply for financial aid is not necessarily a lack of knowledge that it exists but the idea that they do not qualify. Perhaps letting economically disadvantaged students know that they might qualify and can get support applying would help. Furthermore, “care mail packages” could

include curated information about campus support and existing state/federal programs.

- 4) **Improvement and increase of green spaces on campus:** The Fullerton College Masterplan (2020) recognizes the lack of comfortable shaded outdoor spaces as one of the existing challenges on campus and suggests that a tree corridor would help improve the thermal comfort of students as they navigate the campus. Especially as urban temperatures rise, disadvantaged students may find the campus a refuge from extreme heat. Furthermore, greater shade in west facing locations would help with energy savings. Aside from thermal reasons, campus gardens promote student health and wellbeing. When combined with placards, gardens can provide educational opportunities for students to learn about native vegetation and their ethnobotanical value. It could be one of many ways our native students see ethnobotanics represented on campus and students at large increase their access and time in green spaces.

- 5) **Increased partnerships:** Fullerton College could promote innovative partnerships like the one reported by Foods and Nutrition in their latest Program Review (2021). Faculty from Foods and Horticulture are exploring ways to create farm-to-table curriculum, where students can both grow their foods in Horticulture and cook them in their Nutrition courses. Generations of Associated Students have expressed interest and support for a community garden and community kitchens. Materializing these aspirations would require planning and staffing, but there is tremendous potential in these efforts in improving student access to healthy foods. Some of these projects could be funded with the support of the annual Environmental Justice Grant from the California Environmental Protection Agency.

- 6) **Enrollment & Recruitment:** GIS is a powerful tool for geographically targeted recruitment. It can be used to identify nearby high schools and their population of seniors for recruitment. It can also be used for strategic advertisement based on county level demographic data.

Most of these recommendations are not resource intensive and can be addressed with one-time funds for research, planning, and implementation. We believe any or a combination of these strategies could help many students overcome the critically disadvantaged environmental contexts of their neighborhoods by increasing student access to campus resources.

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