



TRANSPORTATION EQUITY CURRICULUM APPLIED LEARNING WORKBOOK

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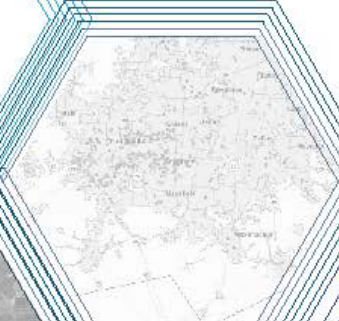
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FINAL REPORT

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Disclaimer

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16. Abstract This workbook is a companion document to the Transportation Equity Curriculum Guidance Document. The assignments included in the workbook build on the latest practices in equity analysis and applied and experiential learning strategies to expand on the learning objectives in the Transportation Equity Curriculum. Assignments are designed to enhance key skills for emerging professionals and encourage students to “think outside of the box”. The assignments involve detailed work completed by students that reinforces what is taught in class, encourages students to explore topics beyond what is presented in the class session, and in some cases, allows students to practice skills used in professional practice. Instructions, resources, instructor notes, example applications, and a sample rubric are provided to support instructors in delivering the assignments and evaluating students’ capabilities upon completion of each assignment.			
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About the Transportation Equity Curriculum Applied Learning Workbook

This workbook is a companion document to the *Transportation Equity Curriculum Guidance Document*. Assignments included in the workbook are designed to further student understanding of concepts and methods addressed in the curriculum and encourage students to “think outside of the box.” The assignments reinforce what is taught in class, encourage students to explore topics beyond what is presented in the class session, and in some cases, allow students to practice skills used in professional practice.

How to Use this Workbook

The Transportation Equity Curriculum Applied Learning Workbook provides assignments relative to social equity in transportation. The workbook includes 20 assignments that build on experiential learning applications and analysis techniques aimed at guiding students through analyses and activities relevant to equity in transportation decision-making processes.

The assignments relate to the modules included in the Transportation Equity Curriculum. Several of the assignments contained in this workbook apply to more than one module. Table 1 summarizes the assignments and those modules that are especially relevant to that assignment. Although this workbook was developed for use with the Transportation Equity Curriculum, the assignments can be completed in any course on equity in transportation or with content related to transportation equity.

Table 1. Modules and Relevant Assignments

Assignments	Module 1: History and Theory of Transportation	Module 2: Identifying Underserved Communities and their Needs	Module 3: Equity in Travel Analysis	Module 4: Involving Underserved Communities	Module 5: Evaluating Plans and Projects	Module 6: Access to Opportunity	Module 7: Equity of Emerging Modes	Module 8: Transportation and Public Health	Module 9: Transportation Funding
Social Justice in Transportation Essay	X								
Equity in Transportation History	X	X		X					
Comparing Equity Components in Transportation Plans	X				X	X			

Assignments	Module 1: History and Theory of Transportation	Module 2: Identifying Underserved Communities and their Needs	Module 3: Equity in Travel Analysis	Module 4: Involving Underserved Communities	Module 5: Evaluating Plans and Projects	Module 6: Access to Opportunity	Module 7: Equity of Emerging Modes	Module 8: Transportation and Public Health	Module 9: Transportation Funding
Commentary on Equity Issues in Transportation	X	X		X	X				
Data Sources for Equity Assessments		X	X		X	X			
Developing a Community Profile		X	X			X			
Assessing the Transportation Needs of Underserved Communities		X	X			X		X	
Community Engagement Activity		X		X					
Neighborhood Mapping		X	X			X		X	
Walk Audit		X	X			X		X	
Urban Planning Cooperative Game				X		X		X	
Case Study Think-Pair-Share					X			X	
Socio-Economic Mobility Report						X			
Policy Brief on Transportation and Health								X	
Policy Brief on Transportation Funding and Equity									X

Assignments	Module 1: History and Theory of Transportation	Module 2: Identifying Underserved Communities and their Needs	Module 3: Equity in Travel Analysis	Module 4: Involving Underserved Communities	Module 5: Evaluating Plans and Projects	Module 6: Access to Opportunity	Module 7: Equity of Emerging Modes	Module 8: Transportation and Public Health	Module 9: Transportation Funding
Identifying Transit Underserved Areas			X			X			
Calculating Job Accessibility		X	X			X			
Evaluating Pedestrian Safety in Underserved Communities		X						X	
Equity Analysis of Shared Micromobility							X		
Equitable Positioning of Electric Vehicle (EV) Charging Stations							X	X	
<p>“X” identifies modules that are best suited for the assignment based on assignment details, module content, and learning objectives. These are suggestions and the instructor is encouraged to review the assignments to determine which assignments meet their course learning objectives and student needs.</p>									

Each assignment is organized using the following template to allow easy application by the instructor:

Prerequisites: Identifies courses and skills needed to complete the assignment (e.g. GIS, quantitative analysis, etc.) for select assignments.

Purpose: Describes why the assignment is being assigned and the expectations of the assignment.

Skills: Identifies goals for 3 key skills developed/anticipated skill level at the end of the assignment according to the following:

Skill	Select level (1-5) for 3 skills
Analysis	
Collaboration/Teamwork	
Communication	
Creativity	
Critical thinking	
Decision-making	
Negotiation	
Problem solving	
Public speaking/Presenting	
Research	
Strategic thinking	
Other (define)	

Instructions: Provides detailed instructions and a list of materials and data needed to complete the assignment.

Final Product: Describes the final deliverable for the assignment, including the deliverable type (e.g. report, essay, white paper, policy brief, worksheet, case study, presentation, etc.), elements (report sections, formulas, maps, etc.), and formatting requirements (page length, word count, etc.).

Example applications: Demonstrates the processes and/or final product for the assignment. These examples are provided for select assignments and, depending on the purpose of the example, are either integrated into the assignment instructions or follow the instructor notes.

Instructor Notes: Includes suggested instructions and resources for the instructor to support them in assigning and assessing this activity.

NOTE: The instructor notes are provided in a separate section.

Sample Rubric

A sample rubric is provided at the end of this workbook. The rubric is designed as a guideline to assess student level of proficiency in mastering the three skills identified for each assignment. When available, instructors are encouraged to use standards established by their institution for grading assignments and providing feedback to students.

Skills	Excellent	Good	Poor
Skill 1	Exceeds the standard	Meets the standard	Does not meet the standard
Skill 2			
Skill 3			

The assessment rubric is adapted from sample rubrics provided to the Planning Accreditation Board (Planning Accreditation Board, n.d.)

Assignments

Social Justice in Transportation Essay

Purpose

The purpose of this assignment is to help you understand how mobility and social justice are interrelated. It encourages research into contemporary issues related to urban mobility and social justice.

Instructions

Write a 500- to 700-word essay that connects mobility to social justice. You may either write a prompt of your own or choose from the prompts provided below. While your prompt may come from any source, all of the works cited in your essay must be from a credible source (e.g., websites ending in .gov, .org, .edu, peer-reviewed publications, and/or professional societies such as [ASCE](#), [ITE](#), and [APA](#)).

If you choose to write your own prompt, but don't know what might be suitable, consider basing your prompt on a recent news item, blog post, opinion piece, or a recent webinar (see, for example, webinars by the [Eno Center for Transportation](#)).

Example resources for prompts:

Gidigbi, S. (2020, June 26). Better transportation policies could play a big role in dismantling structural racism. Opinion | How Planes, Trains, and Automobiles Worsened America's Racial Divide. POLITICO. <https://www.politico.com/news/magazine/2020/06/26/the-racial-history-of-planes-trains-and-automobiles-340285>

Fleischer, M. (2020, June 24). A freeway divides a middle-class neighborhood? Lessons from the past ought to inform a more just and equitable future. Opinion | L.A. freeways are the most racist California monuments. Los Angeles Times. <https://www.latimes.com/opinion/story/2020-06-24/bulldoze-la-freeways-racism-monument>

TransForm. (2020). Could congestion pricing actually lead to more equitable transportation? Pricing Roads, Advancing Equity. https://www.transformca.org/sites/default/files/Pricing_Roads_Advancing_Equity_Combined_FINAL_190128_0.pdf

Schmitt, A. (2020, August 27). Walking deaths fall disproportionately on marginalized people with fewer political resources to demand reforms. 'Certain streets are designed to kill': How U.S. roadways target minorities and the poor. Fast Company. <https://www.fastcompany.com/90543235/certain-streets-are-designed-to-kill-how-u-s-roadways-target-minorities-and-the-poor>

Final Product

Write a 500- to 700-word essay. Include authoritative references in APA style to support your claims.

Skills

Critical thinking	★ ★ ★ ★ ★
Communication	★ ★ ★ ★
Research	★ ★ ★

Equity in Transportation History

Purpose

The purpose of this assignment is to help you:

- Understand the process of conducting historical research
- Learn more about the history of transportation in a community, particularly the impacts of transportation decisions
- Identify and evaluate solutions to address historical inequities

Skills

Creativity	★ ★ ★ ★ ★
Problem solving	★ ★ ★ ★
Research	★ ★ ★ ★ ★

Instructions

You are a practicing transportation professional tasked with researching the transportation history in your city. You will use your findings to help your agency learn from the past and shape a more equitable and inclusive transportation future.

Step 1: Begin by researching the current land use, transportation, and population characteristics of your city. This information can include land use, the location of activity and employment centers, population size, socio-demographic information, location of underserved communities, commuting trends, commute mode share, and any other relevant information. Information is available from a variety of sources:

- Use Census/American Community Survey data or local data to collect information on your city.
- Review existing land use and transportation plans to identify the location of major activity centers, roadways, transit, bicycle, and pedestrian infrastructure, etc.
- Some local governments include maps or other resources on their website that identify communities based on various indicators, including low-income populations, minority populations, persons with disabilities, etc.
- Other helpful resources to assess socio-demographic, social, and/or physical characteristics include:
 - US Department of Transportation, Transportation Disadvantaged Census Tracts <https://usdot.maps.arcgis.com/apps/dashboards/d6f90dfcc8b44525b04c7ce748a3674a>
 - Environmental Protection Agency, EJSCREEN: <https://ejscreen.epa.gov/mapper/>
 - U.S. Census Bureau, My Community Explorer: https://experience.arcgis.com/experience/13a111e06ad242fba0fb62f25199c7dd/?utm_medium=email&utm_source=govdelivery
 - Environmental Protection Agency, EnviroAtlas Interactive Map: <https://www.epa.gov/enviroatlas/enviroatlas-interactive-map>
 - Policy Link, National Equity Atlas Interactive Map: <https://nationalequityatlas.org/>
 - Policy Map: <https://www.policymap.com/maps>
 - The Opportunity Atlas: <https://www.opportunityatlas.org/>
 - Urban Institute, Spatial Equity Data Tool: <https://apps.urban.org/features/equity-data-tool/>
 - Center For Neighborhood Technology, Interactive Tools: <https://cnt.org/tools>

Step 2: Review and evaluate available historical plans and documents from your city. If these documents are not available online, you may need to contact the City Clerk's Archives and Records Department (or similar department). Use available documents to create an accurate timeline and write the story of transportation in your city. Be creative! As you develop your timeline and story, consider if and how equity, equality, and justice are addressed.

More information on writing historical papers is available here:

https://dohistory.org/on_your_own/toolkit/research.html

Final Products

1. Produce a 2-page report about the story of transportation in your city that includes the following elements:
 - a. Introduction – Describe the purpose of the report; include a description of the study area (land area, land use and transportation infrastructure, population size, socio-demographic information, location of underserved communities, commuting trends, and any other significant information).
 - b. Outcomes - Positive and negative outcomes of transportation (include items such as access to opportunity, community cohesion, safety, gentrification, cumulative impacts, displacement, etc.).
 - c. Implications - The implications for equity and fairness (consider if underserved communities were impacted by transportation decisions and to what extent).
 - d. Interventions - Identify if there are current or planned interventions to mitigate identified inequity (plans, projects, policies, etc.). Assess how well these interventions are addressing or will address equity.
 - e. Suggestions - provide a list of 3-5 suggestions to advance transportation equity in the city.
2. Develop a 3-minute presentation that includes your timeline, key highlights from your story, and suggestions to advance transportation equity in the city.

Comparing Equity Components in Transportation Plans

Purpose

The purpose of this assignment is to provide an opportunity for you to assess how agencies currently address equity in transportation. You will:

- Employ critical thinking skills to evaluate and compare agency plans.
- Use your knowledge of equity in transportation to provide feedback on the plans you reviewed.

Instructions

Step 1: Identify two agencies and compare how equity is addressed in the agency transportation plans. Plans can include the long-range transportation plan (LRTP), metropolitan transportation plan (MTP), regional transportation plan (RTP), transportation element of the comprehensive plan, or mobility plans. The two agencies selected should meet the following criteria:

- Be the same agency type (e.g., MPO (see also TPO, COG, RPC), city, or county transportation department, etc.)
- Serve a similar population size and, if possible, have similar demographic compositions
- Be in a similar geographic region (south, midwest, northeast, etc.)

Step 2: Review each plan and complete the following:

- Identify if and how each agency is addressing equity beyond federal and state requirements.
- Identify how each agency evaluates equity and if there is a transportation equity initiative or a transportation equity plan in place.
- Review each agency's goals as they relate to equity and assess how well the plans align with these goals. Make a note if the agency goals do not address equity.

Optional: If the plans you review include a project prioritization component, complete the following:

- Identify if equity is listed as a criterion.
- Identify the number of points are allocated to projects that advance equity.
- Determine if the prioritization process is weighted. If it is, identify how equity criteria are weighted.

Step 3: Compare the equity components of both agencies' plans and complete the following:

- Identify if one plan is more robust in addressing equity than the other. If so, describe what makes each plan more or less robust.
- Identify if there are equity-related elements in one plan that are not included in the other.
- Consider other comparisons that you can make between the two plans.

Step 4: Feedback – list three to five comments about each plan as they relate to equity in transportation. These comments can highlight where the plan is most effective in advancing equity and/or areas for improvement. Provide supporting evidence for your comments.

Step 5: Consider the feedback you would give to each agency regarding its plan and its equity components.

Skills

Critical thinking ★ ★ ★ ★ ★

Analysis ★ ★ ★

Research ★ ★ ★

The following resources may provide additional context for your review:

- Williams, K., Kramer, J., Keita, Y., Deba Enomah, L., and Boyd, T. (2019). Integrating equity into MPO project prioritization. <https://ctedd.uta.edu/wp-content/uploads/2022/04/CTEDD-018-03-Final-Report.pdf>
- Singer, J. (2018). Inside the nations first transportation equity program. <https://medium.com/vision-zero-cities-journal/inside-the-nations-first-transportation-equity-program-6af080c7d71d>
- Boukdad, S., Kohler, B., Geraghty, L., and Braun, H. (n.d.). 3 ways to measure your city's transportation equity next year. <https://www.nlc.org/article/2020/12/29/3-ways-to-measure-your-citys-transportation-equity-next-year/>
- Creger, H., Espino, J., Sanchez, A. (n.d.). Mobility equity framework: How to make transportation work for people. (<https://greenlining.org/wp-content/uploads/2018/03/Mobility-Equity-Framework-Final.pdf>)
- The City of Portland. (n.d.). What is the PBOT equity matrix? <https://www.portland.gov/transportation/justice/pbot-equity-matrix>

Final Product

Produce a 5-page report that includes the following elements:

1. Introduction – Describe the purpose of the report.
2. Agency Overviews – Describe each agency. Include a description of the following:
 - a. Agency types
 - b. Population sizes and demographic compositions
 - c. Geographic areas
 - d. Any other important information
3. Plan Descriptions – Describe the plans being reviewed. Include a description of the following:
 - a. The plan type
 - b. The equity components
 - c. How equity is evaluated
 - d. How well the plans and equity components align with the agency goals

Optional: Project Prioritization – if the plan includes a project prioritization component, identify the following:

 - e. If equity is listed as a criterion.
 - f. The number of points are allocated to projects that advance equity.
 - g. If the prioritization process is weighted or not. If it is, identify how equity criteria are weighted.
4. Comparison – describe how the equity components of both agencies' plans compare. In your response answer the following questions:
 - a. Is one plan more robust in addressing equity than the other? What evidence supports your conclusion?
 - b. Are there equity-related elements in one plan that is not included in the other?
 - c. What other comparisons can you make between the two plans?
5. Feedback – list three to five comments about each plan as they relate to equity in transportation. These comments can highlight where the plan is most effective in advancing equity and/or areas for improvement. Provide supporting evidence for your comments.

Commentary on Equity Issues in Transportation

Purpose

The purpose of this assignment is to help you analyze transportation through an equity lens and think critically about the equity impacts of transportation-decision-making.

Instructions and Resources

Step 1: Watch the presentation by Richard Marcantonio at the Plenary Session: Transportation Equity Roundtable <https://trec.pdx.edu/events/professional-development/transportation-and-communities-summit-2015> (starting at 30minutes 0 seconds ending at 58minutes 30 seconds). The presentation slides are also available on the website.

Step 2: As you watch the presentation make note of the following:

- The key takeaways from the presentation,
- The critiques of metropolitan planning organization (MPO) equity analysis methods, and
- Solutions that Richard Marcantonio proposes to address the identified critiques of MPO equity analysis methods.

Step 3: After watching the presentation, make a note of your position on and opinions of the points made during the presentation. Include the following:

- If you agree or disagree with the critiques made during the presentation.
- If you agree or disagree with the proposed solutions identified during the presentation.
- The potential implications of your stance on the issues discussed (positive and negative)

Step 4: Conduct research on the critiques and proposed solutions discussed in the presentation. Be sure to use credible sources (e.g., websites ending in .gov, .org, .edu, peer-reviewed publications, and/or professional societies such as ASCE, ITE, and APA).

Step 5: Consider if the existing research supports or contradicts your position.

Final Product

Write a 2- to 3-page essay that includes the following:

1. A summary of the presentation by Richard Marcantonio. Include a description of the following in your summary:
 - a. The key takeaways from the presentation,
 - b. The critiques of MPO equity analysis methods, and
 - c. Solutions that Richard Marcantonio proposes to address the identified critiques of MPO equity analysis methods.
2. Your position on the points made during the presentation.
 - a. Indicate whether you agree or disagree with the critiques made during the presentation. Provide detailed and evidence-based explanation of why you agree or disagree using credible sources (e.g., websites ending in .gov, .org, .edu, peer-reviewed publications, and/or professional societies such as ASCE, ITE, and APA) to support your position.

Skills

Critical thinking	★ ★ ★ ★ ★
Problem solving	★ ★ ★ ★
Research	★ ★ ★

- b. Indicate whether you agree or disagree with the proposed solutions identified during the presentation. Provide detailed and evidence-based explanation of why you agree or disagree using credible sources (e.g., websites ending in .gov, .org, .edu, peer-reviewed publications, and/or professional societies such as ASCE, ITE, and APA) to support your position.
3. A conclusion that contextualizes the key points identified in the essay and considers the implications of the position(s) you discussed in your essay.

Data Sources for Equity Assessments

Purpose

The purpose of this assignment is to help you understand the data needed to assess the existing conditions in a community using equity-based factors.

Instructions

Step 1: Review the equity categories in the worksheet below.

Step 2: Identify key types of data and information you would collect to better understand a community's transportation needs.

Step 3: Complete the worksheet using the following prompts:

- What questions do you need to ask under each category to understand the community's transportation needs?
- What data do you need?
- What variables do you consider?
- What methods can be applied to analyze the data?
- Are there other categories that should be included in the worksheet?

Final Product

Submit the completed worksheet.

Skills

Critical thinking ★ ★ ★

Problem solving ★ ★ ★

Strategic thinking ★ ★

Data Needs	Data Sources	Variables	Methods
<u>Community Characteristics</u>			
<u>Access to Opportunity</u>			
<u>Environment</u>			
<u>Safety</u>			
<u>Active Transportation</u>			
<u>Public Transportation</u>			
<u>Investments and Burdens</u>			
<u>Other Categories</u>			

Developing a Community Profile

Purpose

The purpose of this assignment is to help you learn how to identify underserved populations as part of a community profile. You will explore population data and examine population characteristics as they relate to equity in transportation.

Instructions

The instructor will select and assign an area or areas (city, unincorporated area, or neighborhood) that you will evaluate to identify underserved populations and build a community profile. You will use the Transportation Equity Audit Tool: <https://www.cutr.usf.edu/wp-content/uploads/2021/09/Transportation-Equity-Audit-Tool.pdf> to collect information on the population characteristics in the area.

*See the Transportation Equity Toolkit for more information about the Audit Tool: <https://www.cutr.usf.edu/wp-content/uploads/2021/09/CTEDD-Transportation-Equity-Toolkit-04212021.pdf>

Step 1: Review the audit tool sections on Community Characteristics.

Step 2: Complete the section for *Agency Staff or Community Organizers*. Data for the community characteristics can be collected using ACS Data, Census Data, and/or local agency data.

- Make a note if you are unable to find the data needed to complete certain sections of the audit tool.
- Consider if there are other/additional variables that you would like to include in your analysis.

*For more information, see Evaluating the Distributional Effects of Regional Transportation Plans and Projects: https://pdxscholar.library.pdx.edu/cgi/viewcontent.cgi?article=1139&context=trec_reports Table 15 for data sources and metrics for identifying underserved communities.

Step 3: Develop a visual representation of the study area, including the community characteristics using graphs, figures, and maps. At a minimum, show the following:

- The overall study area and area size in square feet.
- The sociodemographic information collected in step 2 and, if available, commuting information for the community members.
- The transportation infrastructure (roadways, sidewalks, bike lanes, transit routes and stops, etc.)
- Two destinations that you identify as essential for the community members (for example schools, parks, employment centers, grocery stores, healthcare facilities, etc.). These destinations should be based on the population characteristics you identified in step 2. You will need to explain why you selected these destinations and how they add to your equity analysis.
- At least one additional variable that you identify as important to understanding transportation equity in the community (for example affordability, walkability, safety, etc.). These variables should be based on the population characteristics you identified in step 2. You will need to explain why you selected the variable and how it adds to your equity analysis. To visually represent this information, you can select one of the three options below:

Skills

Creativity	★ ★ ★
Presenting	★ ★ ★
Research	★ ★ ★ ★ ★

- Option A: You can use existing data and maps. Some local governments include maps and other resources on their website that identify communities and highlight existing conditions based on various indicators. Other helpful resources to assess and identify the sociodemographic, social, and physical characteristics of communities such as income, race, age, health, quality of life, walkability, access to opportunity, etc. include the following:
 - US Department of Transportation, Transportation Disadvantaged Census Tracts <https://usdot.maps.arcgis.com/apps/dashboards/d6f90dfcc8b44525b04c7ce748a3674a>
 - Environmental Protection Agency, EJSCREEN: <https://ejscreen.epa.gov/mapper/>
 - U.S. Census Bureau, My Community Explorer: https://experience.arcgis.com/experience/13a111e06ad242fba0fb62f25199c7dd/?utm_medium=email&utm_source=govdelivery
 - Environmental Protection Agency, EnviroAtlas Interactive Map: <https://www.epa.gov/enviroatlas/enviroatlas-interactive-map>
 - Policy Link, National Equity Atlas Interactive Map: <https://nationalequityatlas.org/>
 - Policy Map: <https://www.policymap.com/maps>
 - The Opportunity Atlas: <https://www.opportunityatlas.org/>
 - Urban Institute, Spatial Equity Data Tool: <https://apps.urban.org/features/equity-data-tool/>
 - Center For Neighborhood Technology, Interactive Tools: <https://cnt.org/tools>
- Option B: If you have GIS skills or other graphic/illustrative design skills, you can use GIS or other software to generate your own maps.
- Option C: You can use a combination of existing maps and your own maps to visually represent the study area.

*Be sure to reference all sources used.

Step 4: Equity insights - Consider the following questions as you conduct your analysis:

1. What characteristics stand out about the community? Are there a significant number of underserved populations? How do you know? Do you have any other insights about the community characteristics?
2. What conclusions can you draw about the community's transportation needs based on the sociodemographic data, the existing transportation infrastructure, and the community elements? What are the potential transportation equity implications for the community?
For example, think about the travel needs of each population group (e.g. families with small children, single-parent households, older adults, etc.) and how the existing land use and transportation infrastructure meets or does not meet those needs (e.g. proximity to schools, employment, healthcare and access to sidewalks, bike lanes, transit, etc.)
3. Is ACS and Census data (or other data used) suitable for equity analysis? Why or why not? In what ways can sociodemographic data be more equitable?

*Be prepared to discuss your responses in class.

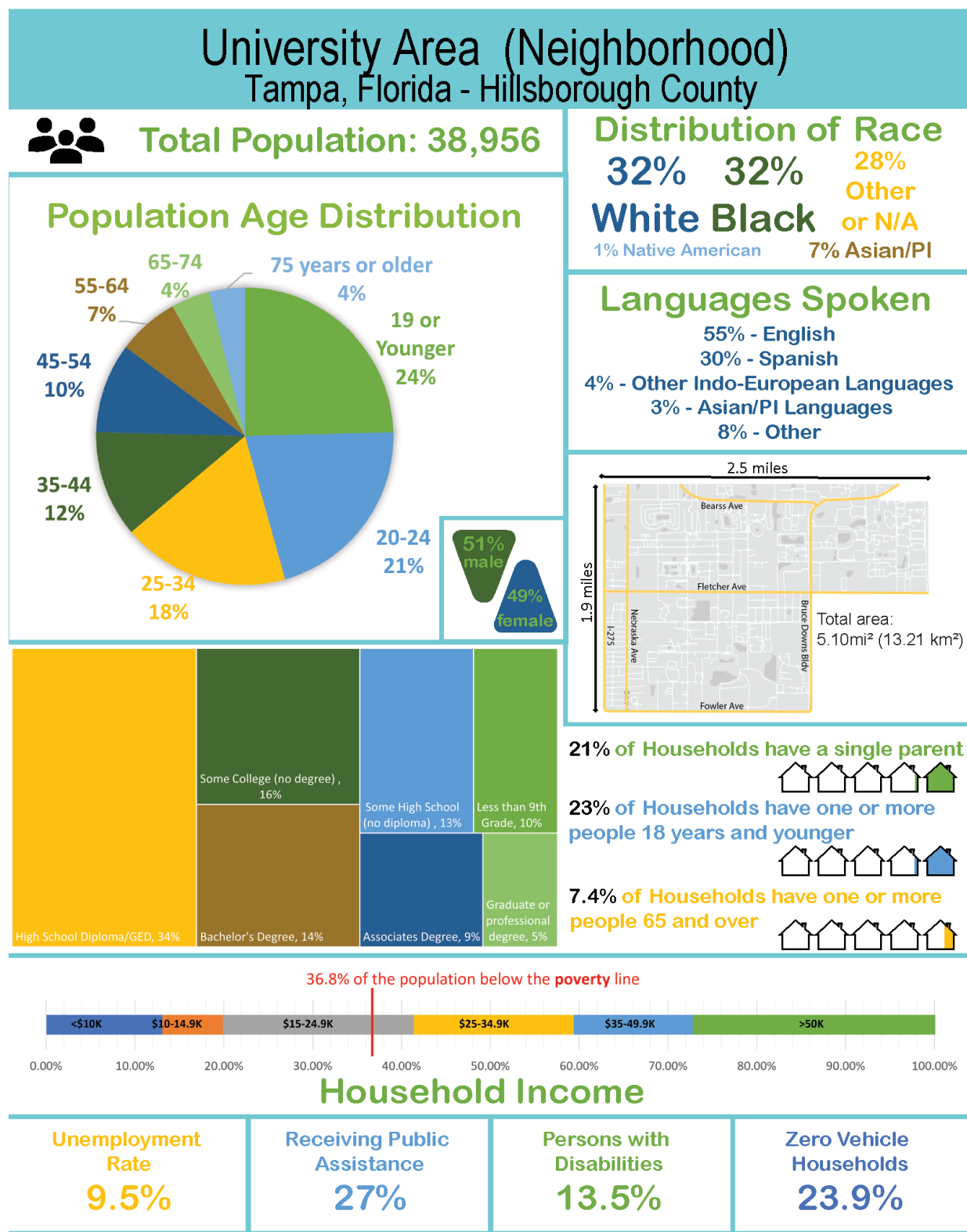
Final Product

Using the results from the Community Characteristics section of the audit tool, and the graphs, figures, and maps you developed create a 1- to 2-page infographic-style profile of the community that communicates the transportation equity insights you identified for the community. Include the following elements:

1. Study area – Describe the study area. Include the following:
 - a. Area type
 - b. Area size in square feet
2. Sociodemographic information about the community population including the proportion of individuals that are underserved using variables such as:
 - a. Age
 - b. Race/ethnicity
 - c. Languages spoken
 - d. Households with a single parent
 - e. Households with one or more people under 18 years
 - f. Households with one or more people 65 years and over
 - g. Persons with disabilities
 - h. Education level/school enrollment
 - i. Income
 - j. Unemployment rate
 - k. Population receiving public assistance
 - l. Zero vehicle households
 - m. Other variables you selected
3. Transportation/commuting information (if data is available)
 - a. The average number of miles traveled from home to work (or school)
 - b. The average commute time
4. An illustrative map or maps showing the overall study area, transportation infrastructure (roadways, sidewalks, bike lanes, transit routes and stops, etc.), the two destinations you identified as essential, and the additional variable you selected as important to understanding transportation equity in the community.
5. Your equity insights from your responses in step 4.

Present your infographic to the class and discuss the transportation equity insights for the community.

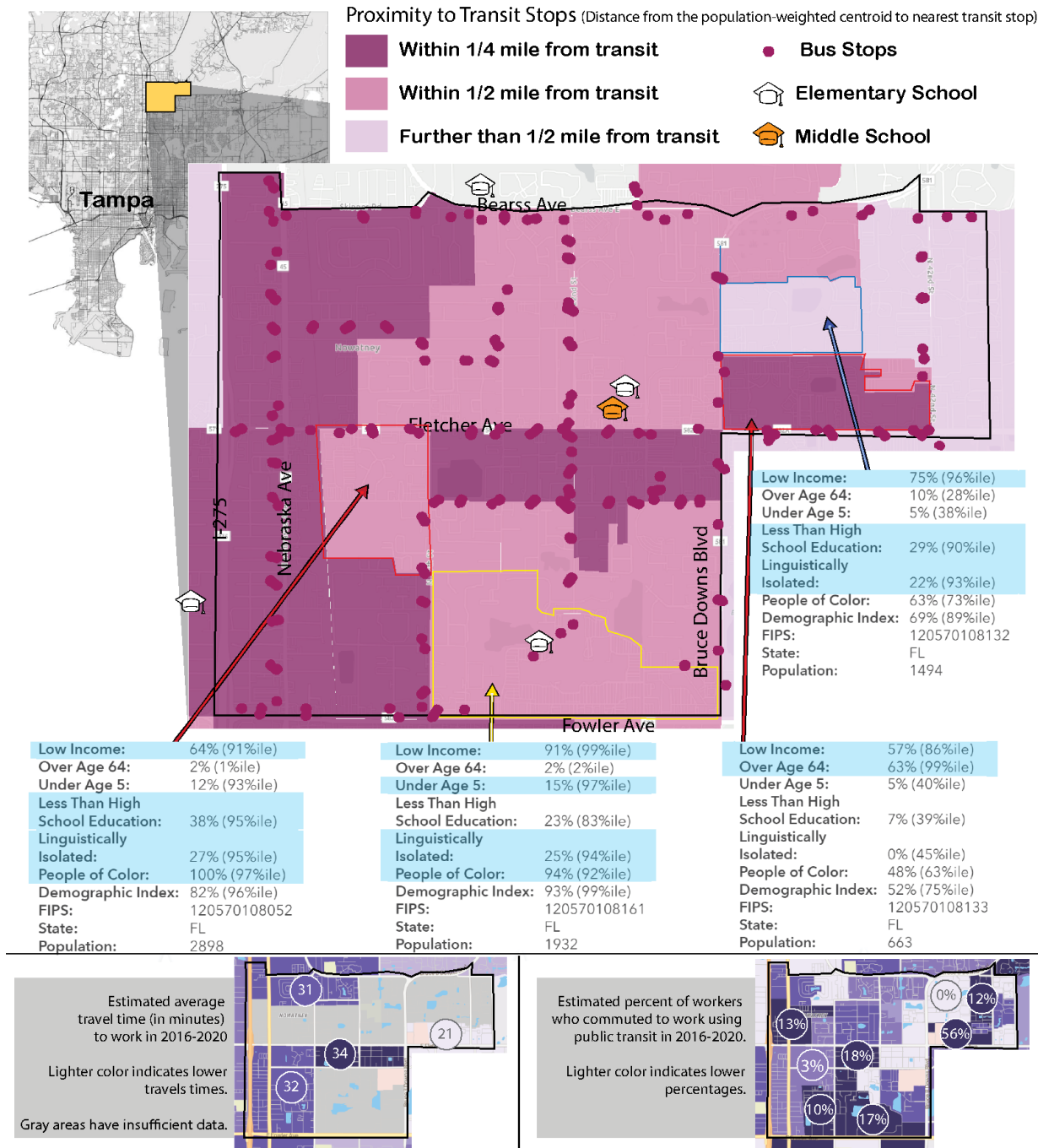
Example Application



Data collected from 2020 ACS 5-year Estimate- Census Tracts 108.05, 108.08, 108.14-108.17, 108.19-108.24

University Area (Neighborhood)

Tampa, Florida - Hillsborough County



Using the threshold-based approach to evaluate Communities of Concern from https://pdxscholar.library.pdx.edu/cgi/viewcontent.cgi?article=1139&context=trec_reports
 Socioeconomic Indicator data source: <https://ejscreeen.epa.gov/mapper/>; Travel Time and Commuter Percentage Using Transit data source: <https://www.policymap.com/newmaps/>
 National Walkability Index source: <https://epa.maps.arcgis.com/home/webmap/viewer.html?webmap=f16f5e2f84884b93b380cf4be9f0bba>
 HART bus stop source: <https://gis.tpcmaps.org/arcgis/rest/services/Websites/HART/MapServer>



TRANSPORTATION EQUITY AUDIT TOOL

Community Characteristics

Agency Staff or Community Organizers

Use census, state, regional, or local data to complete the following section of the audit tool.

Where is the audit being conducted?

Community Name/Corridor: University Area (Neighborhood)
 City: Tampa
 County: Hillsborough Zip Code: 33612
 Population size: 38,956

(Data on Page 1 and 2 from 2020 ACS 5-year Estimate- Census Tracts 108.05, 108.08, 108.14-108.17, 108.19-108.24)

Identify the percentages for each of the following community characteristics:

Age

19 or younger 24.6%
 20-24 years old 21.1%
 25-34 years old 18.2%
 35-44 years old 11.6%
 45-54 years old 9.8%
 55-64 years old 6.7%
 65-74 years old 4.2%
 75 years or older 3.9%

Race or ethnicity

African American/Black 32.3%
 Caucasian/White 32.4%
 Asian/Pacific Islander 6.8%
 Hispanic or Latino 35.7%
 Native American 1.2%
 Multi-Racial 17.6%
 Other: 16.4%

Language spoken

English 54.7% Other Indo-European languages: 4.4%
 Spanish 30.1 Asian and Pacific Island languages: 3.1%
 Creole n/a
 Other: 1.6

Households with a single parent 21.2%
 Households with one or more person(s) under 18 years 23.1%

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Households with one or more person(s) 65 years and over 7.42%

Persons with disabilities 13.5%

Educational level

Less than 9th grade 9.5%
 Some high school, no diploma 12.9%
 High school diploma/GED 33.8%
 Some college, no degree 15.7%
 Associate's degree 8.6%
 Bachelor's degree 14.3%
 Graduate or professional degree 5.2%

School enrollment

Nursery school or preschool 1.1% (426)
 Kindergarten 0.8% (324)
 Elementary school (grades 1-8) 8.2% (3,186)
 High school (grades 9-12) 4.1% (1,627)
 College or graduate school 22.4% (8,751)

Household income

Less than \$10,000 13.1%
 \$10,000 - 14,999 6.8%
 \$15,000 - \$24,999 21.5%
 \$25,000 - \$34,999 18%
 \$35,000 - \$49,999 13.4%
 \$50,000 or more 27.3%

Population below the poverty level _____

Unemployment rate 9.5%

Population receiving public assistance 27%

This number represents the % of households with cash
 publish assistance or Food Stamps/SNAP according to the
 2020: ACS 5-Year Estimates

Zero vehicle households 23.9%

Mode share used to commute to work

Car, truck, or van (drive alone) 64%
 Car, truck, or van (carpool) 18%
 Public transportation 5.6%
 Walked 4%
 Other 3.5%
 Worked at home 4.2%





Is there a school in the community (*Check all that apply*)?

- ☒ Nursery school or preschool
- ☒ Kindergarten
- ☒ Elementary school (grades 1-8)
- ☒ High school (grades 9-12)
- ☒ College or graduate school

What is the average number of miles traveled from home to work (or school)?

- ☐ 1-5 miles
- ☐ 6-10 miles
- ☐ 11-15 miles
- ☐ 16-20 miles
- ☐ 21-25 miles
- ☐ 26-30 miles
- ☐ 31-35 miles
- ☐ More than 35 miles

What is the average commute time?

- ☐ Less than 15 minutes
- ☒ Between 15 and 30 minutes
- ☐ Between 30 and 45 minutes
- ☐ Between 45 and 60 minutes
- ☐ Over an hour

3

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Assessing the Transportation Needs of Underserved Communities

Purpose

The purpose of this assignment is to help you:

- Understand the process of identifying existing transportation conditions
- Practice evaluating transportation benefits and burdens

Instructions

The instructor will select and assign an area or areas (community, neighborhood, or corridor). You will assess the transportation needs of underserved populations in the area you were assigned and identify a set of project alternatives that can address the identified transportation needs. You will use the Transportation Equity Audit Tool: <https://www.cutr.usf.edu/wp-content/uploads/2021/09/Transportation-Equity-Audit-Tool.pdf> to collect information on the community characteristics and existing transportation conditions in the area.

*See the Transportation Equity Toolkit for more information about the Audit Tool:

<https://www.cutr.usf.edu/wp-content/uploads/2021/09/CTEDD-Transportation-Equity-Toolkit-04212021.pdf>

Step 1: Review the audit tool sections: Community Characteristics, Access to Opportunity, Environment, Safety, Active Transportation, Public Transportation, Investments and Burdens, and Overall Ratings.

Step 2: For Community Characteristics, complete the section for Agency Staff or Community Organizers. Data for the community characteristics can be collected using ACS Data, Census Data, or local agency data.

- Some local governments include maps or other resources on their website that identify communities and highlight existing conditions based on various indicators. Other helpful resources to assess the sociodemographic, social, and physical characteristics of communities such as income, race, age, health, quality of life, walkability, access to opportunity, etc. include:
 - US Department of Transportation, Transportation Disadvantaged Census Tracts <https://usdot.maps.arcgis.com/apps/dashboards/d6f90dfcc8b44525b04c7ce748a3674a>
 - Environmental Protection Agency, EJSCREEN: <https://ejscreen.epa.gov/mapper/>
 - U.S. Census Bureau, My Community Explorer: https://experience.arcgis.com/experience/13a111e06ad242fba0fb62f25199c7dd/?utm_medium=email&utm_source=govdelivery
 - Environmental Protection Agency, EnviroAtlas Interactive Map: <https://www.epa.gov/enviroatlas/enviroatlas-interactive-map>
 - Policy Link, National Equity Atlas Interactive Map: <https://nationalequityatlas.org/>
 - Policy Map: <https://www.policymap.com/maps>
 - The Opportunity Atlas: <https://www.opportunityatlas.org/>
 - Urban Institute, Spatial Equity Data Tool: <https://apps.urban.org/features/equity-data-tool/>
 - Center For Neighborhood Technology, Interactive Tools: <https://cnt.org/tools>

Step 3: To complete the remaining sections of the audit, you will participate in a walking, biking, or transit tour of the area. This tour can be organized by the instructor, by group members if you are working with a group, or it can be done as an individual exercise.

Skills	
Analysis	★ ★ ★ ★
Critical thinking	★ ★ ★ ★ ★
Problem solving	★ ★ ★ ★ ★

- If conducting a walking or biking tour, select a major roadway corridor in the study area. Focus on a segment about ½ mile in length that has logical termini, such as signalized intersections, landmarks, or natural features. It should have more than one lane in each direction and serve as an existing transit route, with bus stops in the area.
- If conducting a transit tour, identify a route within the study area, or one that includes multiple stops in the study area. Select a starting location at a designated stop and at least one stop along the route.
- For the access to opportunity section, select a mode (walking, cycling, transit, taxi or rideshare, or personal vehicle) and a destination (employment, education, community service, shopping, health care, or grocery store) in or near the community (e.g. within a 10-minute bus ride).
- Use your selected mode to travel to and from the identified destination.

Step 4: Log your transportation experience using the Transportation Equity Audit Tool. You can also use available data on transportation in the area to complete some of the sections.

Step 5: Evaluate the audit results using Table 2. SWOT Analysis Matrix and Table 3. Cause and Consequence Analysis Matrix provided below. Refer to your responses for Step 2 to ensure the needs identified are based on the community characteristics. Be prepared to justify/explain your responses for each of these evaluations.

Step 6: Use your responses to the SWOT analysis and cause and consequence analysis to identify 3 high-priority needs for the community.

Step 7: Develop a purpose and need statement

- With the 3 high-priority transportation needs in mind, develop a need statement.
- Develop a purpose statement to advance transportation equity in the area.
- Combine the two into a concise purpose and need statement that can serve as a foundation for the development of project goals, objectives, and conceptual alternatives.

Step 8: Develop a set of proposed alternatives

- Based on your purpose and need statement, identify and describe 3 alternatives for transportation strategies to address the high-priority needs identified. Explain how the proposed strategies can address the needs and build on strengths, take advantage of opportunities, address weaknesses, and mitigate threats.
- Select a preferred strategy and explain why this strategy was selected.
- Identify potential next steps.

Table 2. SWOT Analysis Matrix

	Benefits	Burdens
Existing	<p><u>Strengths</u></p> <p>List existing assets that are beneficial to the area.</p>	<p><u>Weaknesses</u></p> <p>List the assets that need improvement or the area lacks.</p>
Future	<p><u>Opportunities</u></p> <p>List trends that can positively impact the area.</p>	<p><u>Threats</u></p> <p>List trends that can create or worsen barriers in the area.</p>

Table 3. Cause and Consequence Analysis Matrix

Need	Causes	Consequences	Difficulty to Correct [low, medium, high]	Criticality 1 2 3 4 5
Example: Community members have to walk/bike along the roadway to reach nearby shops and businesses, but they do not feel safe	There is no sidewalk and lots of traffic	Increase in fatalities	Medium	5
Need 1				
Need 2				
Need 3				

Final Product

Using the results from the audit tool and evaluation, write a 5-page report. Include the following elements:

1. Introduction – Describe the purpose of the report
2. Study area – Describe the study area. Include the following:
 - a. Area type and size (square feet for communities and neighborhoods, length for corridors)
 - b. Sociodemographic information about the community population (use the information collected for the *Community Characteristics* section of the Transportation Equity Audit Tool)
 - c. Residential areas, employment centers, educational facilities, community services and shopping areas, health care, grocery stores or markets, and other key destinations in or near the area (within the community/neighborhood or within a ¼ mile of the study corridor)
 - d. Transportation infrastructure (roadways and number of lanes, posted speed limit, sidewalks, bike lanes, multi-use paths, transit routes and stops, etc.)
3. Transportation conditions - Describe the findings from each section of the audit tool and additional observations from the tour:
 - a. Access to opportunity
 - b. Environment
 - c. Safety
 - d. Active transportation
 - e. Public transportation
 - f. Investments and burdens
 - g. Summarize the overall transportation experience
4. Transportation needs – Summarize the results from the SWOT analysis and cause and consequence analysis to describe the high-priority transportation needs in the area.
 - a. Explain how the transportation conditions translate into community needs. What conditions have caused the need to exist and continue to persist? What are the consequences if the need is not addressed? Based on the consequences and criticality, what are 3 high-priority transportation needs in the area? Explain your answers.
5. Purpose and need statement – Document the purpose and needs statement developed in Step 7.
6. Alternatives – Document the proposed alternatives, preferred strategy, and potential next steps identified in Step 8.
7. Appendix – Include the complete SWOT analysis matrix and Cause and Consequence Analysis matrix in an appendix.

Community Engagement Activity

Purpose

The purpose of this assignment is to help you:

- Understand the public participation process
- Critically analyze public participation techniques
- Gain experience in community engagement

Instructions

Attend a local public engagement event and document your observations and experiences.

Step 1: Review or prepare a list of public engagement events related to transportation planning and investment decisions in your area. The event can be for the city, county, metropolitan planning organization (MPO), state department of transportation, transit agency, or any other local agency.

Step 2: Attend an event from your list and observe the details of the meeting (feel free to participate in the meeting as a citizen).

- Research the project (or policy issue) details:
 - Where is the project (or policy issue) located?
 - What populations are affected by the project (or policy issue)?
 - When was the project (or policy issue) initiated?
 - At what stage of the project (or policy issue) did this community engagement event take place?
 - How does the event fit into the broader context of the project (or policy issue)?

Step 3: While at the meeting take detailed notes about your observations. Include the following:

- The interest groups:
 - Who are the decision makers and who are the organizers?
 - Who are the participants?
 - Who was represented at the event and how?
 - Who was not represented?
- The engagement techniques used before and during the event:
 - How was the public engaged prior to the event?
 - What kind of public engagement technique(s) were used during this event?
- The issues discussed:
 - What were the participants' desires for the transportation system?
 - What visions of the community did participants express?
 - Do different participants have different needs and visions? How are they different?
 - Were underserved populations among the participants and were their needs discussed?

Step 4: Reflect on the experience attending the meeting

- Do you think the public engagement event was inclusive and effective?
- What do you think can be done to improve it?
- How do you feel about the engagement process overall?

Skills

Analysis	★ ★ ★ ★
Critical thinking	★ ★ ★ ★ ★
Observation	★ ★ ★ ★

Final Product

Prepare a 3- to 4-page paper on your community engagement experience, including critical points on diversity, equity, and inclusion. Include citations from the class readings and/or other credible sources. Your paper should include the following:

1. A summary of the event describing:
 - a. The project (or policy issue)
 - b. The interest groups
 - c. The engagement techniques used before and during the event
 - d. The issues discussed
2. A short reflection on the experience
3. An Appendix
 - a. Submit your notes and any documents collected from the event as a separate document or append them to the essay.

Neighborhood Mapping

Purpose

The purpose of this assignment is to help you:

- Understand the process of spatially representing neighborhood characteristics through mapping
- Identify barriers to walking, cycling, and transit use for different populations
- Understand the relationship between opportunities for active travel and health equity

Skills	
Analysis	★ ★ ★ ★ ★
Collaboration/ teamwork	★ ★ ★
Observation	★ ★ ★ ★ ★

Instructions

You will map neighborhood assets, amenities, land uses, and sociodemographic information in a neighborhood with underserved populations (e.g., low income and minority, persons with disabilities, older adults, etc.).

Step 1: Form a group of 2 to 3 students, and as a group, choose a neighborhood to map for the assignment. The neighborhood must be relatively close so that you can do fieldwork and meet the following criteria:

- Have at least one major roadway corridor running through it or abutting it.
- Be defined as an underserved community or be within an underserved community.

Some local governments include maps or other resources on their website that identify communities and highlight existing conditions based on various indicators. Other helpful resources to assess the sociodemographic, social, and physical characteristics of communities such as income, race, age, health, quality of life, walkability, access to opportunity, etc. include:

- US Department of Transportation, Transportation Disadvantaged Census Tracts <https://usdot.maps.arcgis.com/apps/dashboards/d6f90dfcc8b44525b04c7ce748a3674a>
- Environmental Protection Agency, EJSCREEN: <https://ejscreen.epa.gov/mapper/>
- U.S. Census Bureau, My Community Explorer: https://experience.arcgis.com/experience/13a111e06ad242fba0fb62f25199c7dd/?utm_medium=email&utm_source=govdelivery
- Environmental Protection Agency, EnviroAtlas Interactive Map: <https://www.epa.gov/enviroatlas/enviroatlas-interactive-map>
- Policy Link, National Equity Atlas Interactive Map: <https://nationalequityatlas.org/>
- Policy Map: <https://www.policymap.com/maps>
- The Opportunity Atlas: <https://www.opportunityatlas.org/>
- Urban Institute, Spatial Equity Data Tool: <https://apps.urban.org/features/equity-data-tool/>
- Center For Neighborhood Technology, Interactive Tools: <https://cnt.org/tools>

Step 2: Conduct background research and collect data for supporting sociodemographic information on the neighborhood residents. This information may include three or more of the following variables:

- Income
- Age
- Gender
- Race/ethnicity
- Languages spoken

- Households with a single parent
- Households with one or more people under 18 years
- Households with one or more people 65 years and over
- Persons with disabilities
- Education level
- Unemployment rate
- Population receiving public assistance
- Zero vehicle households

Step 3: Prepare a neighborhood map that includes information about the neighborhood's populations, amenities, and street network.

- The map should provide information about:
 - The neighborhood boundaries (perceived or objective)
 - The locations of houses, parks, stores, bus stops, schools, churches, offices, and other key destinations in the neighborhood
 - Important neighborhood features, amenities, or assets
 - The street network and selected physical features of the streets, such as sidewalks, bike lanes, intersections, crosswalks (and if applicable, areas where people cross without crosswalks), traffic signals and stop signs, bus shelters, bike racks, street furniture, signage, trash cans, trees, curb ramps, pavement markings, etc.
- The neighborhood map can be produced in any format. Some examples include a hand-drawn cognitive map, a copy/screenshot from Google Earth or Google Maps with elements overlaid using a program of your choice, a map produced with geographical information systems (GIS), or a map generated using a graphic editor or design software such as Adobe Photoshop. For this step, you can choose to collect information virtually, in the field, or using a combination of both.
- The purpose of the map is not only to select a street but also to have a better understanding of the equity issues in the area by knowing who lives in the neighborhood and who may potentially be using the street.

Step 4: Review your map and think about what you have learned about the neighborhood in step 2.

- What conclusions can you draw about the transportation network in the neighborhood?
- Are there gaps or barriers in the transportation network that affect accessibility, safety, mobility, affordability, and/or the environment in the neighborhood?
- Are there any potential equity implications that you have identified from this exercise?

Final Product

Create a poster about the neighborhood using the information collected about the neighborhood's population, amenities, and street network. The poster should include the following elements:

1. A population profile that is a snapshot of the neighborhood sociodemographic composition.
2. A neighborhood map that identifies the neighborhood boundary, street network, physical features, key destinations, neighborhood features and amenities, and/or assets.
3. Highlights describing the equity implications learned from this exercise.

The poster will be exhibited in class.

Walk Audit

Purpose

The purpose of this assignment is to help you:

- Learn how to conduct a walk audit
- Understand the concept of walkability and its impacts on active travel
- Critically evaluate the built environment through observation

Skills	
Analysis	★ ★ ★ ★
Collaboration/ teamwork	★ ★ ★
Observation	★ ★ ★ ★ ★

Instructions

You will conduct a walk audit of a major roadway (arterial, major collector) that also provides access to businesses, schools, and/or other community services or facilities.

Step 1: Form a group of 2 to 3 students, and as a group, choose a neighborhood with an underserved population. The neighborhood must have at least one major roadway corridor running through it or abutting it. It is best if the area is relatively close so that you can do fieldwork. (The instructor may select the neighborhood for your group).

Step 2: Select a major roadway corridor in the neighborhood for a walk audit. Focus on a segment about ½ mile in length that has logical termini, such as signalized intersections, landmarks, or natural features. It should have more than one lane in each direction and serve as an existing transit route, with bus stops in the area.

- Use one or more of the worksheets identified below to guide your walk audit:
 - AARP Walk Audit Tool Kit <https://www.aarp.org/livable-communities/getting-around/info-2014/aarp-walk-audit-tool-kit.html>
 - AARP Walk Audit Tool Kit Leader Guide <https://www.aarp.org/content/dam/aarp/livable-communities/livable-documents/documents-2016/Walk-Audit-Tool-Kit/AARP-Walk-Audit-Leader-Guide-100416.pdf>
 - Walkability Checklist <https://www.nhtsa.gov/sites/nhtsa.gov/files/walkingchecklist.pdf>
 - Aspen Hill Vision Zero Study Walk Audit Checklist: <https://montgomeryplanning.org/wp-content/uploads/2018/12/AHVZ-walk-audit-checklist-web-english.pdf>
 - NADTC Toolkit for the Assessment of Bus Stop Accessibility, <https://www.nadtc.org/wp-content/uploads/NADTC-Toolkit-for-the-Assessment-of-Bus-Stop-Accessibility.pdf>
 - Additional worksheets may be provided by your instructor

Step 3: Conduct the walk audit:

- Prepare for the walk audit fieldwork. Be sure to:
 - Bring your worksheet, a map, and a pen/pencil to take notes.
 - Wear appropriate shoes and clothing for walking (bright colors, safety vest if available, etc.)
 - Plan to complete the exercise during the day, so that there is enough time to complete the walk audits while the streetscape is most visible.
- During your walk audits, be sure to:
 - Always be aware of your surroundings and considerate of the people and places you are observing.
 - Collaborate with your partners, remember to take notes, and put information in the worksheet.
 - Take pictures. You may also choose to record video and sound, etc.

- Always observe the roadway environment with critical eyes and think about how equity is shaped by the use and design of space.
- Use more than your eyes to sense the space. Try to smell, hear, and feel the roadway environment. How comfortable is the walk along the roadway? Do you feel safe?
- Keep the broader neighborhood in mind as you walk along the roadway. Can you access other parts of the neighborhood easily?

Step 4: As you conduct the walk audit or after the walk audit, think about and document your responses to the following questions:

- What is unique about the roadway selected for the walk audit?
- Who are the users of the roadway – what are their genders, ages, races, and physical abilities?
- How do they use the roadway? Are there any barriers to them using the roadway?
- What travel modes are accommodated on the roadway and which travel modes are most prominent?
- What kind of inequities are created or exacerbated through the use and design of the roadway?
- What street features do you think are missing?

Step 5: Write a short list (3 to 5) of suggestions to remove barriers on the roadway and improve equity for all users of the street and the neighborhood members.

Final Product

Write a 2- to 3-page report synthesizing your findings from the walk audit and walk audit worksheet. Include the following in your report:

1. Introduction
 - a. Describe the purpose of the report.
 - b. Briefly describe the study site/roadway.
 - c. Identify and describe the walk audit worksheet used (type of worksheet, sections, categories, other information). If you selected the worksheet, provide a brief explanation of why you selected the worksheet used.
2. Summary
 - a. Summarize the walk audit.
 - b. Summarize the following:
 - i. What is unique about the roadway selected for the walk audit
 - ii. The users of the roadway
 - iii. How the roadway is used
 - iv. Barriers to using the roadway
 - v. Travel modes that are accommodated on the roadway and the most prominent travel modes
 - vi. The kind of inequities that are created or exacerbated through the use and design of the roadway
 - vii. Street features that are missing
3. Suggestions
 - a. Provide a short list (3 to 5) of suggestions to remove barriers on the roadway and improve equity for all users of the street and the neighborhood members.

Urban Planning Cooperative Game

Purpose

The purpose of this assignment is to help you:

- Become familiar with the transportation planning process
- Understand the needs and concerns of different interest groups
- Learn negotiation and conflict resolution skills to achieve the best outcomes for economic development, health, and social equity in the planning process

Skills	
Collaboration/ Teamwork	★ ★ ★
Conflict resolution	★ ★ ★ ★ ★
Negotiation	★ ★ ★ ★ ★

Instructions

In this assignment, you will play a cooperative game of urban transportation planning. The goal is to prepare a strategic plan for a bus rapid transit (BRT) project. You will be sorted into multiple stakeholder groups and tasked with representing the interests of those groups.

Setting: Acme City is in a metropolitan area of 550,000 inhabitants. The city plans to build a bus rapid transit (BRT) line to promote sustainable transportation and increase active travel.

Complete the assignment by following the steps below:

Step 1: Join one of the five stakeholder groups listed. Each group should have the same number of students (ideally 5 people per group).

- **Metropolitan Planning Organization (MPO):** An MPO is the policy board created by federal law to carry out the metropolitan transportation planning process. MPOs oversee the region's transportation planning, facilitating collaboration between governments, interested parties, and residents in the planning process.

Concerns: The MPO supports the project as planned but is concerned about the lack of connections to local transit service for the transit-dependent population.

- **State Department of Transportation (DOT):** State DOTs allocate resources from various Federal-aid programs. They also develop scoring systems to evaluate projects across all travel modes and determine the funding priority.

Concerns: The DOT would like to have seen the money spent on highway expansion rather than bus rapid transit, because transit ridership has been declining.

- **Transit agency:** Provide public transportation services to local communities. Transit providers set annual targets, use technology to provide reliable route scheduling, reduce carbon footprint, and promote community growth.

Concerns: The transit agency wants the project to attract more premium riders – people who would normally drive alone but may use transit if it is more convenient. They would prefer the stations to be near these riders and their destinations.

- **Community organization:** A non-profit organization that helps to advocate for the needs of underserved communities. Community organizations provide programs, offer services, and engage in other activities that promote and support community development.

Concerns: The community organization feels that the project overlooks the needs of transit-dependent populations. For example, it passes through a low-income, minority community but has no station in that community.

- **The traveling public:** Users of the transportation system, including people of all ages, races, genders, and abilities. They contribute opinions on their transportation needs through multiple kinds of public participatory activities.

Concerns: The traveling public is mostly concerned about highway congestion and opposes the transit project as a waste of money that could be better spent on widening the highway.

Step 2: Within your stakeholder group, make a list of visions and goals for the BRT project and identify the project's impact on the transportation system, economy, health, and equity. To accomplish this step, it is recommended that each student prepare a list of items and work as a group to compile a final list.

Step 3: Separate each stakeholder group into breakout groups (each breakout group should have one representative from the MPO, the DOT, the transit agency, the community organization, and the traveling public). Within each breakout group, stakeholder representatives will share their lists of visions and goals for the BRT project. Together, the group will identify and discuss their similar and conflicting interests and attempt to develop an agreed-upon list of visions and goals. Stakeholders are encouraged to negotiate with their interests in mind.

Step 4: Rejoin the original stakeholder groups. Based on the roles and interests, as well as insight from the breakout groups, discuss and evaluate the stakeholder group's visions and goals for the BRT project. Propose a revised vision for the BRT, and include at least one goal and one specific strategy to achieve the stated goal or goals.

Step 5: As a class, discuss the visions, goals, and strategies proposed by each stakeholder group and prepare a BRT strategic plan. The strategic plan should integrate the values and inputs from each stakeholder group. To do this, the class as a whole must agree on a vision for the BRT project, decide how many goals and strategies to include, identify and select a set of criteria to prioritize the goals, and use the criteria to prioritize each goal.

The following resources provide information on negotiation and conflict resolution:

- Shonk, K. (2021). Top 10 negotiation skills you must learn to succeed.
<https://www.pon.harvard.edu/daily/negotiation-skills-daily/top-10-negotiation-skills/>
- Wilson, R. (2019). Negotiation skills are a must for planning managers.
<https://www.planning.org/blog/9182728/negotiation-skills-are-a-must-for-planning-managers/>
- Holsen, T. (2020). Negotiations between developers and planning authorities in urban development projects. *The Planning Review*, 56:3, 34-46,
<https://doi.org/10.1080/02513625.2020.1851904> (see the section on Negotiations)

Final Products

Produce a 3-page reflection paper that includes the following:

1. A description of your stakeholder group and your role within the breakout group.
 - a. What was your experience working within your stakeholder group?
 - b. What was your experience working with the breakout group?
2. A description of the conflicts encountered in the process of developing the strategic plan and a description of opportunities to resolve conflicts.
 - a. What were the greatest obstacles in coming to a resolution?

- b. What strategies were used to come to a resolution at each stage of the assignment (stakeholder groups, breakout groups, class)?
3. A summary of what you learned about negotiation and conflict resolution.
 - a. How might these conflicts play out in a real-world scenario?
 - b. Were there any other stakeholders that should have been included in the negotiation process?
4. Your thoughts on the potential equity implications for underserved populations. Consider the impacts of the project, the negotiation process, and the final strategic plan.
5. A list of 3 to 5 suggestions for strategies that could have made the process more equitable. Describe each suggestion in detail. Provide evidence for your suggestions from credible sources (include citations and references).

Case Study Think-Pair-Share

Purpose

The purpose of this assignment is to help you:

- Understand transportation as a social determinant of health and health equity
- Use critical thinking skills to evaluate transportation projects
- Identify health equity implications in the context of urban and regional development

Instructions

In groups of two, you will analyze a transportation project or policy that could improve health and health equity, such as pedestrian trails, bicycle lanes, speed reduction policies, public transportation infrastructure/service expansion, etc.

Step 1: With a partner, select a transportation project or policy to analyze. The project or policy should be located in your community and region and should have some health and equity implications that are either implicit or explicit, positive or negative.

Step 2: On your own, analyze the project or policy. Address the following in your analysis:

- What are the health-related benefits and risks of the project or policy?
- Who do you think benefits most from the project or policy and who would be negatively affected?
- What are the equity implications? Consider who may be included or excluded in the development process (historic or contemporary), or in the access and use of the transportation infrastructure or service.
- What communities were most included and how?
- Were some communities excluded and to what extent?
- Identify if there are current or planned interventions to mitigate identified inequities (plans, projects, policies, etc.). Assess how well these interventions are addressing or will address equity.
- Identify 3-5 suggestions to advance transportation equity in the community or project area.

Step 3: Get back together with your partner and discuss your analysis.

- Did you come to the same conclusions?
 - What was different and what was the same?
- If needed, refine your analysis based on new or additional information identified through your discussion with your partner.

Step 4: On your own, use your findings to prepare a case study. With your partner, prepare a presentation of your combined findings.

Examples for writing transportation case studies are available here:

- Transport Cases Studies library <https://www.centreforcities.org/case-study-library/case-studies-improving-transport/>; <https://www.centreforcities.org/case-studies/>

Skills	
Analysis	★ ★ ★ ★ ★
Collaboration/ teamwork	★ ★ ★ ★
Critical thinking	★ ★ ★ ★ ★

- Public Health and Transportation Case Studies <https://www.apha.org/topics-and-issues/transportation/public-health-and-transportation-case-studies>
- Complete Streets Case Studies <https://smartgrowthamerica.org/tag/complete-streets-case-studies/>
- Sustainable Transportation Case Studies <https://www.tigurl.org/images/tiged/docs/activities/953.pdf>

Final Products

Develop a 2-page case study. Include the following elements:

1. Introduction
 - a. Describe the purpose of the case study.
 - b. Provide a brief summary of the case.
2. Discussion/Analysis
 - a. Identify key problems identified in the analysis
 - b. Describe the current or planned interventions to mitigate identified inequities (plans, projects, policies, etc.)
 - c. Summarize your assessment of how well these interventions are addressing or will address equity.
3. Recommendations
 - a. Provide a list of 3-5 suggestions to advance transportation equity in the community or project area.
4. Conclusions
5. References
 - a. All sources used should be properly cited and referenced in the document.

Share your joint presentation with the class.

Socio-Economic Mobility Report

Purpose

The purpose of this assignment is to help you understand the relationship between transportation, access to opportunity, and social and economic mobility. You will explore transportation strategies that support access to opportunity and can encourage upward mobility for underserved populations.

Instructions

You will use a combination of online resources and agency interviews to complete this assignment.

Step 1: Conduct an online search to identify the following:

- Definitions for access to opportunity, social mobility, and economic mobility
- How transportation (policies, infrastructure, etc.) affects access to opportunity and social and economic mobility

Step 2: Select a transportation agency of your choice and identify and evaluate one or more strategies used by this agency to improve access to opportunity and socioeconomic mobility for the community (or communities) they serve. You should also identify information on the community (or communities) being targeted through these strategies (community characteristics, transportation conditions, etc.)

Step 3: Use the Opportunity Atlas to identify the estimates for upward mobility for each community:
<https://www.opportunityatlas.org/>

Step 4: Interview local agency staff from the agency you selected to supplement/verify findings from online searches. Interviews can be conducted in person, by phone, online using a virtual meeting platform, or by email. You are responsible for developing your interview questions.

Final Product

Produce a 2-page report synthesizing your findings. All sources should be accurately cited and referenced. The report should include the following elements:

1. Introduction
 - a. Describe the purpose of the report.
 - b. Define social mobility, economic mobility, and access to opportunity.
2. Transportation, Social/Economic Mobility, and Access to Opportunity
 - a. Explain the relationship between transportation, access to opportunity, social mobility, and economic mobility. Justify and support your explanation with evidence from your research.
3. Case Example – Describe the strategies used by the transportation agency you selected to improve access to opportunity.
 - a. Identify the agency name and agency type.
 - b. Describe the community or communities targeted through these strategies. Use your findings from the Opportunity Atlas to describe the estimates for upward mobility for the community or communities.
 - c. Describe the strategies used to improve access to opportunity and socioeconomic mobility for the community or communities.
 - d. Describe any observed or anticipated outcomes documented by the agency or other sources.

Skills	
Analysis	★ ★ ★ ★
Communication	★ ★
Research	★ ★ ★ ★ ★

- e. Provide comments on the strategies. Comments should demonstrate consideration for the effectiveness of the strategies, and potential short- and long-term consequences (positive and negative) on the community or communities affected in light of the estimates for upward mobility.
4. Conclusion – summarize your findings and conclusions.
5. References – All sources used should be properly cited and referenced in the document.
6. Appendix – Include your interview questions and notes.

Policy Brief on Transportation and Health

Purpose

This assignment is designed to help you understand the various ways to communicate about public health in transportation. The policy brief format prepares you to develop one of the products commonly used in a professional setting.

Instructions

Step 1: Select a transportation issue related to public health from the list below, or identify a health-related transportation issue of your choice:

- Access to health care
- Access to healthy and affordable food
- Traffic-related injuries and fatalities
- Air pollution
- Noise pollution
- Physical activity

Step 2: Research the issue you selected and write a policy brief that summarizes information about the issue. As you research the issue, focus on how it specifically affects underserved populations. Your goal is to help potential readers learn more and make informed decisions about the issue as it relates to equity.

The following resources provide additional information on writing a policy brief:

- International Center for Policy Advocacy. (2017). An essential guide to writing policy briefs. https://www.icpolicyadvocacy.org/sites/icpa/files/downloads/icpa_policy_briefs_essential_guide.pdf
- Research to Action. (n.d.). How to plan, write and communicate an effective policy brief. <https://www.researchtoaction.org/wp-content/uploads/2014/10/PBWeekLauraFCfinal.pdf>
- Food and Agriculture Organization of the United Nations. (2011). Food security and communications toolkit. Chapter 4.1: Preparing policy briefs. <https://www.fao.org/3/i2195e/i2195e03.pdf>
- The Writing Center, University of North Carolina at Chapel Hill. (n.d.). Policy briefs. <https://writingcenter.unc.edu/tips-and-tools/policy-briefs/>
- Wong et al. (2016). How to write a health policy brief. <https://www.apa.org/pubs/journals/features/fsh-fsh0000238.pdf>

The following resource provides additional information on framing community health:

- Frameworks. (n.d.). Framing the foundation of community health. <https://www.frameworksinstitute.org/toolkit/framing-the-foundation-of-community-health/>

Final Product

Write a 2-page policy brief on the equity-related impacts of your chosen health-related transportation issue. The policy brief should include:

1. A title – the title should effectively communicate the topic
2. An introduction

Skills

Communication	★ ★ ★ ★ ★
Creativity	★ ★ ★
Research	★ ★ ★ ★ ★

3. The scope of the problem from an equity perspective
4. 3-5 policy alternatives - Be sure to comment on the potential equity impacts for each alternative
5. 3-5 policy recommendations to advance equity in this area
6. References - All sources used should be properly cited and referenced in the document.
7. Optional: Appendix - If needed, a 1-page appendix with documentation can be included at the end of the brief to support your findings.

Policy Brief on Transportation Funding and Equity

Purpose

The purpose of this assignment is to help you understand the equity impacts of transportation funding. The policy brief format prepares you to develop one of the products commonly used in a professional setting.

Instructions

Step 1: Select a funding mechanism from the list below or identify a funding mechanism of your choice.

- Increasing motor fuel taxes and other existing federal user fees
- Allowing states and metro areas to toll existing general-purpose interstate highways
- Instituting mileage-based user fees for interstate use to replace other user fees
- Dedicating more of existing federal aid to the interstates
- Continue status quo (with general fund transfers)
- Applying carbon tax or cap-and-trade fees in part to highway funding

Step 2: Research the issue you selected and write a policy brief that summarizes information about the issue. As you research the issue, focus on how it specifically affects underserved populations. Your goal is to help potential readers learn more and make informed decisions about the issue as it relates to equity.

The following resources provide additional information on writing a policy brief:

- International Center for Policy Advocacy. (2017). An essential guide to writing policy briefs. https://www.icpolicyadvocacy.org/sites/icpa/files/downloads/icpa_policy_briefs_essential_guide.pdf
- Research to Action. (n.d.). How to plan, write and communicate an effective policy brief. <https://www.researchtoaction.org/wp-content/uploads/2014/10/PBWeekLauraFCfinal.pdf>
- Food and Agriculture Organization of the United Nations. (2011). Food security and communications toolkit. Chapter 4.1: Preparing policy briefs. <https://www.fao.org/3/i2195e/i2195e03.pdf>
- The Writing Center, University of North Carolina at Chapel Hill. (n.d.). Policy briefs. <https://writingcenter.unc.edu/tips-and-tools/policy-briefs/>

Final Product

Write a 2-page policy brief on the equity-related impacts of your chosen transportation funding mechanism. The policy brief should include:

1. A title – the title should effectively communicate the topic
2. An introduction
3. The scope of the problem from an equity perspective
4. 3-5 policy alternatives - Be sure to comment on the potential equity impacts for each alternative
5. 3-5 policy recommendations to advance equity in this area
6. References - All sources used should be properly cited and referenced in the document.
7. Optional: Appendix - If needed, a 1-page appendix with documentation can be included at the end of the brief to support your findings.

Skills	
Communication	★ ★ ★ ★ ★
Creativity	★ ★ ★
Research	★ ★ ★ ★ ★

Identifying Transit Underserved Areas

Prerequisites

- Entry-level statistics
- GIS

Purpose

The purpose of this assignment is to help you identify transit underserved areas with high percentages of low-income households and discuss the equity implications of transit access. You will:

- Become familiar with bus stop data and American Community Survey (ACS) data.
- Use GIS to identify block groups with high percentages of low-income households using descriptive statistics.
- Spatially overlay bus stop data onto block groups with high percentages of low-income households and evaluate transit access.
- Interpret data and results to understand the equity implications.

Instructions

Note:

- The example application for this assignment uses ACS data in 2011 for Hillsborough County, Florida; and low-income household threshold set to \$35,000.
- Links to data are provided where available. Data are also provided as downloadable files.
- You will need access to ArcGIS Pro

Step 1: Find census data needed for the analysis.

- For demonstration purposes, the example application will use Hillsborough County, Florida's census data for 2011 (5 year estimate). American Community Survey (ACS) data is found at https://www2.census.gov/programs-surveys/acs/summary_file/2011/data/.
- In the ACS file transfer protocol (ftp), go to the folder, '5_year_by_state'. Download 'Florida_Tracts_Block_Groups_Only': https://www2.census.gov/programs-surveys/acs/summary_file/2011/data/5_year_by_state/Florida_Tracts_Block_Groups_Only.zip, and then extract all files.

Step 2: Build a new map and define (select) the study area.

- Open ArcGIS Pro, open 'catalog' and specify your workplace directory. Find the folder where you want to save your data, right click, and 'add folder connection'. Now the ACS data can be shown in the catalog.
- Add the block groups shapefile to 'content'. Open the attribute table of 'ACS_11_5YR_BG_12_FLORIDA' and click 'select by attributes'. Click 'new expression', and choose the right input, the Hillsborough County's FIPS code is 057, and apply to select the block groups in Hillsborough County, as shown in Transit Underserved Areas: Figure 1.
- Click 'apply' and all block groups in Hillsborough County should be selected, as shown in Transit Underserved Areas: Figure 2.

Skills

Analysis	★ ★ ★ ★ ★
Critical thinking	★ ★ ★
Problem solving	★ ★ ★

Select By Attributes ? x

Input Rows
ACS_11_5YR_BG_12_FLORIDA

Selection type
New selection

Expression
Load Save Remove

SQL ☐

Where COUNTYFP is equal 057

+ Add Clause

☐ Invert Where Clause

Apply OK

Transit Underserved Areas: Figure 1. Select a subgroup (block groups in Hillsborough County, Florida)

1:366,362 845,684.82E 1,404,386.34N ftUS Selected Features: 881

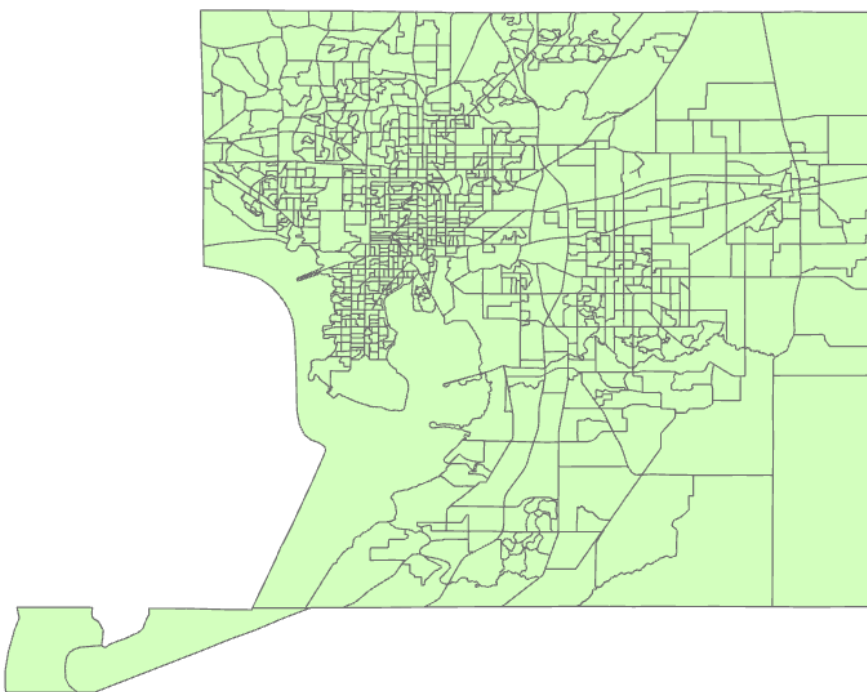
ACS_11_5YR_BG_12_FLORIDA X

Field: Selection: Highlighted:

OBJECTID	SHAPE *	STATEFP	COUNTYFP	TRACTCE	BLKGRPCE	GEOID	NAMELSAD	MTFCC	FUNCSTAT	ALAND
6885	Polygon	12	057	011605	3	120570116053	Block Group 3	G5030	S	6346408
6886	Polygon	12	057	011304	3	120570113043	Block Group 3	G5030	S	1732268
6887	Polygon	12	057	011706	2	120570117062	Block Group 2	G5030	S	596413
6888	Polygon	12	057	011706	4	120570117064	Block Group 4	G5030	S	886951
6889	Polygon	12	057	005900	2	120570059002	Block Group 2	G5030	S	628143
6890	Polygon	12	057	007200	1	120570072001	Block Group 1	G5030	S	651266
6891	Polygon	12	057	007103	3	120570071033	Block Group 3	G5030	S	723911
6892	Polygon	12	057	011204	5	120570112045	Block Group 5	G5030	S	997520
6893	Polygon	12	057	001100	1	120570011001	Block Group 1	G5030	S	348943
6894	Polygon	12	057	011204	1	120570112041	Block Group 1	G5030	S	566433
6895	Polygon	12	057	011108	1	120570111081	Block Group 1	G5030	S	1127001
6896	Polygon	12	057	011407	2	120570114072	Block Group 2	G5030	S	693659
6897	Polygon	12	057	004800	1	120570048001	Block Group 1	G5030	S	767569
6898	Polygon	12	057	006103	3	120570061033	Block Group 3	G5030	S	123875

Transit Underserved Areas: Figure 2. Selected block groups in the attribute table

- Next, right click 'ACS_11_5YR_BG_12_FLORIDA', click 'data', then 'export features' and save the selected features as a new shapefile (see Transit Underserved Areas: Figure 3).



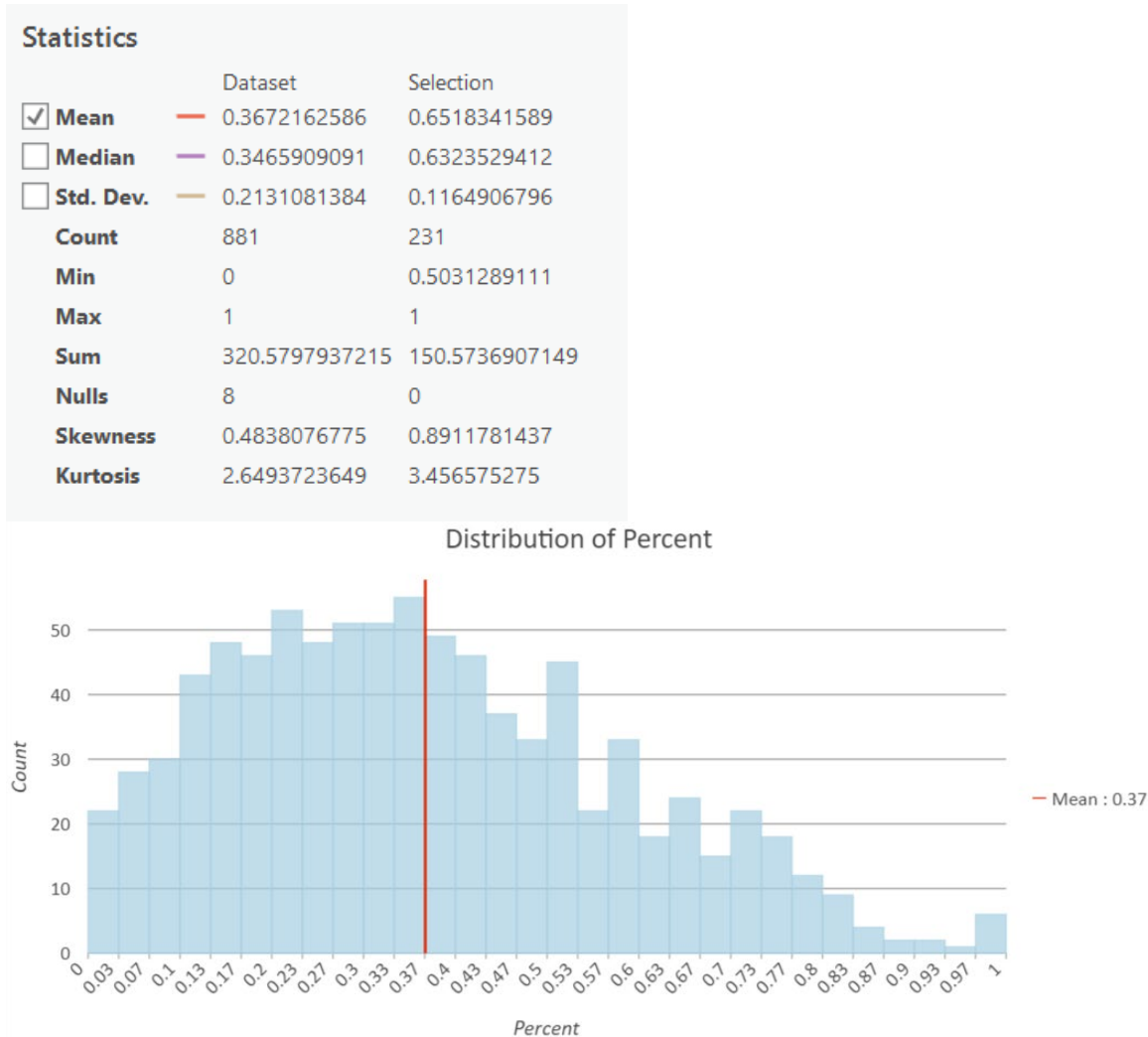
Transit Underserved Areas: Figure 3. Block groups in Hillsborough County, Florida

Step 3: Identify block groups with a high percentage of low-income households.

- Open the ACS metadata and find the percentage of low-income households. The variables indicating household income are in section 19, such as 'B19001e1' (household income in the past 12 months, in 2011 inflation-adjusted dollars) – Universe: households-total estimate.

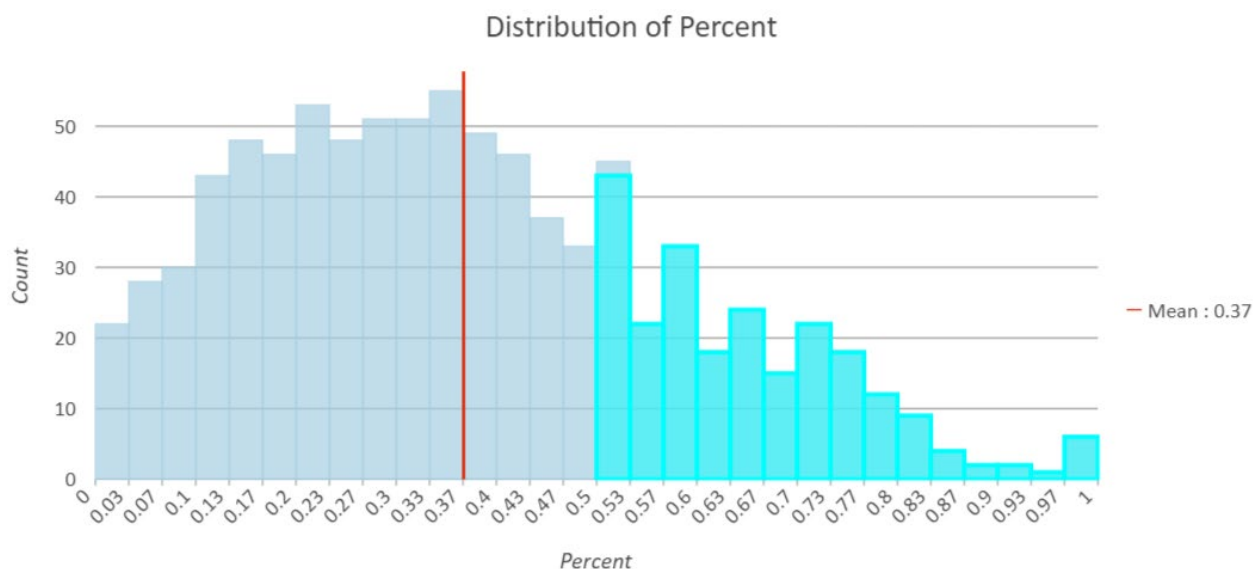
The average household size in 2011 in the US was 2.58. According to US HHS Poverty Guidelines, the poverty threshold for a 2-person family was \$14,710, and the poverty threshold for a 3-person family was \$18,530. Therefore, the poverty threshold for a 2.58-person household would be approximately \$17,000. As determined by the U.S. Census Bureau; low-income is defined as family income less than 200 percent of the poverty threshold. Therefore, a family income lower than \$34,000 would be considered low-income in 2011. US Census data groups income levels into categories: 'less than \$10,000' (B19001e2), '\$10,000 to \$14,999' (B19001e3), '\$15,000 to \$19,999' (B19001e4), etc. To calculate the percentage of low-income households in block groups, this analysis includes these three levels as low-income groups (lower than \$35,000).

- Employ a 'dissolve' process to reduce computational burden. Include 'GeoID', 'B19001e1', 'B19001e2', 'B19001e3', 'B19001e4', 'B19001e5', 'B19001e6', and 'B19001e7' as 'dissolve fields', and exclude all other unimportant features.
- Open the attribute table and add a column named 'percent_low_income'. The percentage of low-income household is equal to 'the number of low-income households' (lower than \$35,000) divided by 'the total number of households' in block groups. A data summary and histogram with descriptive statistics and the distribution provide insights into the percentage of low-income households.
- Open the attribute table, find the 'percent_low_income' column, and then right click and choose 'statistics'. The histogram of the distribution of the percentage of low-income households is shown in Transit Underserved Areas: Figure 4.



Transit Underserved Areas: Figure 4. The distribution of the percentage of low-income households

- The average percentage of low-income households (<\$35,000) in Hillsborough County is 37% as shown in Transit Underserved Areas: Figure 5 and Transit Underserved Areas: Figure 6.



Transit Underserved Areas: Figure 5. Block groups with 50% or more low-income households

Statistics		
	Dataset	Selection
<input checked="" type="checkbox"/> Mean	0.3672162586	0.6518341589
<input type="checkbox"/> Median	0.3465909091	0.6323529412
<input type="checkbox"/> Std. Dev.	0.2131081384	0.1164906796
Count	881	231
Min	0	0.5031289111
Max	1	1
Sum	320.5797937215	150.5736907149
Nulls	8	0
Skewness	0.4838076775	0.8911781437
Kurtosis	2.6493723649	3.456575275

Transit Underserved Areas: Figure 6. Descriptive statistics of the percentage of low-income households

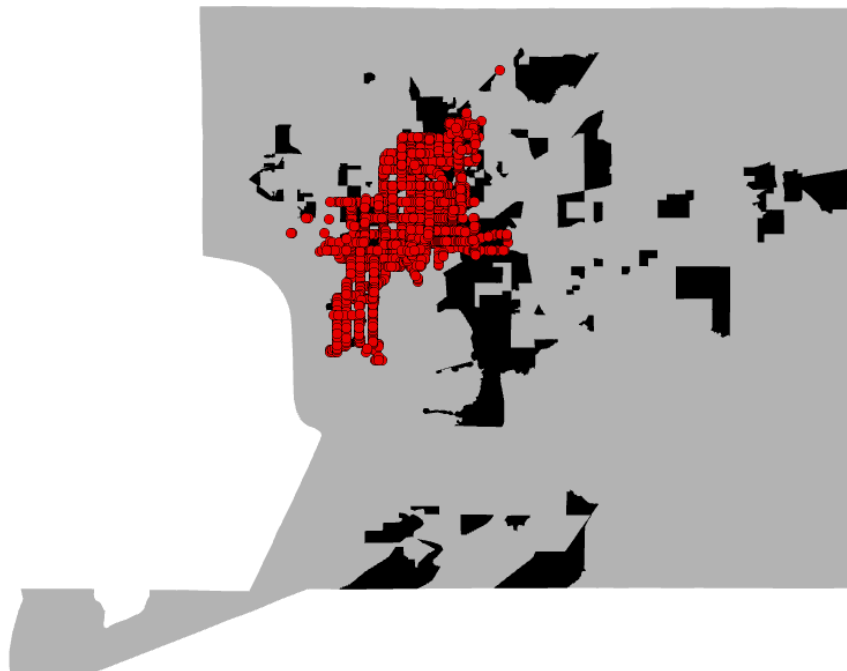
- If we set 50% as the threshold, 231 block groups are selected as areas with relatively high percentages of low-income households as shown in Transit Underserved Areas: Figure 7. Select these block groups and export as 'Hillsborough_low_income_BG'. The average percentage of low-income households in all block groups is 37%, while among block groups with more than 50% of low-income households, the average percentage is increased to 65%.



Transit Underserved Areas: Figure 7. Block groups with more than 50% of low-income households

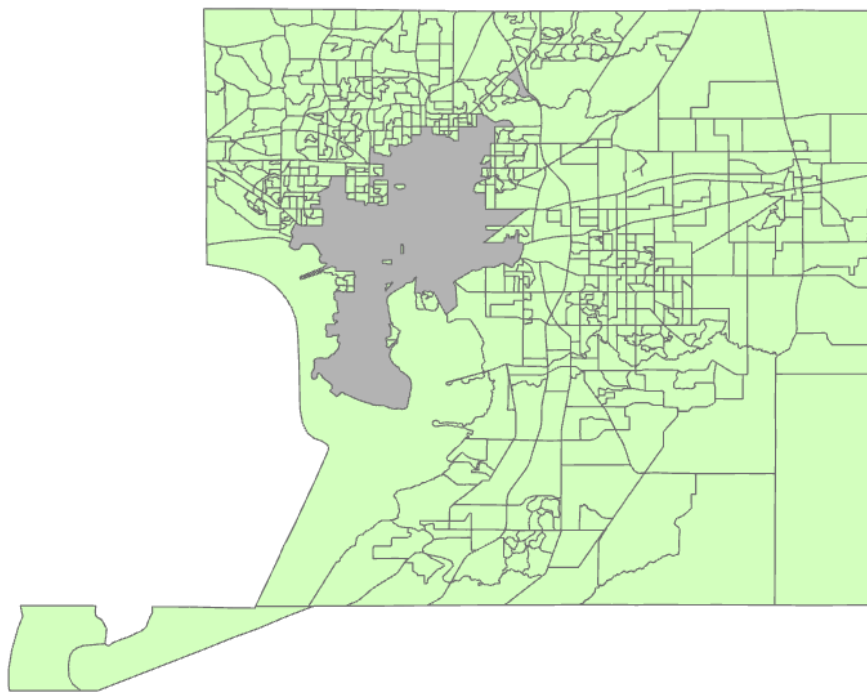
Step 4: Overlay bus stop data onto the map, calculate bus stop density and identify block groups that have no bus stop.

- Download the bus stop data and add it to ArcGIS Pro. The data contains all bus stops operated by Hillsborough Area Regional Transit, USF Bull Runner, Greyhound, Martz, and Pinellas Suncoast. You will see from the data that only the urban core area of Hillsborough County (City of Tampa) has rich access to transit. Many block groups in suburban and rural neighborhoods have no bus stop, and therefore no transit service, as shown in Transit Underserved Areas: Figure 8.



Transit Underserved Areas: Figure 8. Bus stops & block groups with >50% low-income households

- Use the 'spatial join' function in ArcGIS Pro to count the number of bus stops. Search and click the 'spatial join' function, set low-income block groups as target features, and include 'bus_stop_point' as join features. This will provide you with the distribution of bus stop density in space, and block groups with no bus stops can be identified, as shown in Transit Underserved Areas: Figure 9.



Transit Underserved Areas: Figure 9. Block groups with no bus stop

Step 5: Intersect block groups with no bus stop and block groups with more than 50% low-income households.

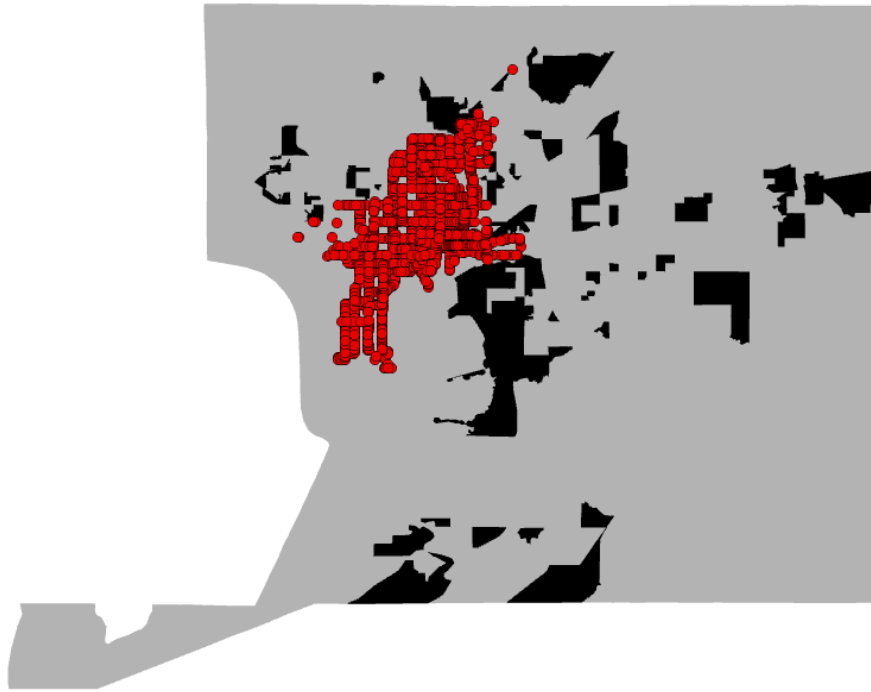
- The resulting map in Transit Underserved Areas: Figure 10 shows 114 low-income block groups with no bus stop.



Transit Underserved Areas: Figure 10. Low-income block groups with no bus stop

Step 6: Review the results. Based on your findings, develop a set of conclusions about transportation equity and access to transit in the study area. Include the transportation equity implications regarding access to transit in underserved, low-income areas and propose 2 to 3 solutions to address access in transit underserved, low-income areas.

- In the example application, the analysis identified 114 block groups with high percentages of low-income households and no bus stops. As shown in Transit Underserved Areas: Figure 11, the majority of the transit underserved areas are low-density areas far from the city center.



Transit Underserved Areas: Figure 11. Low-income households with no direct transit access

Step 7: Consider the limitations of the analysis

- This analysis sets 50% of low-income households as the threshold to identify block groups with underserved populations. This threshold is subjective and if it is reduced, more areas would be identified as low-income block groups, which will change the results. Although the results can vary based on the threshold, this approach still provides a general picture of where transit underserved areas are located. To obtain robust results, more advanced research methods are needed.
- The income threshold used likely does not capture the full population of economically disadvantaged persons that would benefit from transit access.

Final Product

- Map series of:
 - Block groups
 - Block groups with more than 50% of low-income households
 - Bus stops overlayed with block groups with >50% low-income households
 - Block groups with no bus stop
 - Low-income block groups with no bus stop
 - Block groups of high percentages of low-income households with no direct transit access
- 1-page discussion of results and conclusions
 - Describe the results of the analysis, including limitations.
 - Discuss the transportation equity implications regarding access to transit in underserved, low-income areas.
 - Propose 2 to 3 solutions to address access in transit underserved, low-income areas.

Calculating Job Accessibility

Prerequisites

- Entry-level statistics
- GIS

Purpose

The purpose of this assignment is to help you calculate access to job opportunities and identify block groups that have better access to mid to high-wage jobs. You will:

- Become familiar with Longitudinal Employer-Household Dynamics (LEHD) data.
- Learn how to calculate job accessibility.
- Use the spatial analysis to assess job accessibility and identify related equity concerns.

Instructions

Note:

- The example application for this assignment uses 2019 data for Hillsborough County, Florida.
- Links to data are provided where available. Data are also provided as downloadable files.
- You will need access to ArcGIS Pro.

Step 1: Review the formula for Hansen's accessibility model.

- Hansen suggests the use of an accessibility index, A_{ij} to predict the location of a population based on the premise that employment is the predominant factor in determining location. The formula is as follows:

$$A_{ij} = E_j / (d_{ij})^b$$

Where

A_{ij} = accessibility index of zone i with respect to zone j

E_j = total employment

d_{ij} = distance between i and j

b = an exponent

Step 2: Acquire Census data and LEHD data for the analysis.

- Go to <https://lehd.ces.census.gov/data/#i2j>, and scroll down to LEHD Origin-Destination Employment Statistics (LODES).
- Select the version, state/territory, and type to download data.
For the example application, we choose the following criteria, Version: LODES7, State/Territory: Florida, Type: Origin-Destination (OD) data (see Calculating Job Accessibility: Figure 1).

Skills	
Analysis	★ ★ ★ ★ ★
Critical thinking	★ ★ ★
Problem solving	★ ★ ★

LEHD Origin-Destination Employment Statistics (LODES)

LEHD Origin-Destination Employment Statistics (LODES) used by [OnTheMap](#) are available for download below. Version 7 of LODES was enumerated by 2010 census blocks. Previous versions of LODES were enumerated with 2000 census blocks.

Data files are state-based and organized into three types: Origin-Destination (OD), Residence Area Characteristics (RAC), and Workplace Area Characteristics (WAC), all at census block geographic detail. Data is available for most states for the years 2002–2018.

To browse the LODES data files in their directory structure or to access them with a FTP program (must be able to access HTTP), go to lehd.ces.census.gov/data/lodes/.

Download LODES data*:

Version: State/Territory: Type:

Calculating Job Accessibility: Figure 1. LEHD data download instructions

- Notice LEHD data has multiple subsets. In this example application, we are looking at all in-state jobs in 2019. Download the 'fl_od_main_JT00_2019.csv.gz': https://lehd.ces.census.gov/data/lodes/LODES7/fl/od/fl_od_main_JT00_2019.csv.gz, which includes both home and workplace OD data. If we use another data set, for example, residence area characteristics (RAC) data, we will lose workplace information, which is key to calculating job accessibility.
Note: Download LODES Tech Doc to understand the elements included in the data: <https://lehd.ces.census.gov/data/lodes/LODES7/LODESTechDoc7.5.pdf>
- Aggregate the job counts using workplace geocode (w_geocode), denoting E_j in the equation, and save the job counts as a csv file.
In the example application, the aggregated data is provided, named as 'fl_workplace_jobcount'.
- Jobs with mid- to high-range earnings, are coded as SE02 and SE03 as shown in Calculating Job Accessibility: Figure 2. NOTE: The lowest wage job variable SE01 could also be included, but was omitted in this example to emphasize jobs that offer more of a living wage.

The structure of the OD files is as follows:

Origin-Destination (OD) File Structure			
Pos	Variable	Type	Explanation
1	w_geocode	Char15	Workplace Census Block Code
2	h_geocode	Char15	Residence Census Block Code
3	S000	Num	Total number of jobs
4	SA01	Num	Number of jobs of workers age 29 or younger ¹⁸
5	SA02	Num	Number of jobs for workers age 30 to 54 ¹⁸
6	SA03	Num	Number of jobs for workers age 55 or older ¹⁸
7	SE01	Num	Number of jobs with earnings \$1250/month or less
8	SE02	Num	Number of jobs with earnings \$1251/month to \$3333/month
9	SE03	Num	Number of jobs with earnings greater than \$3333/month
10	SI01	Num	Number of jobs in Goods Producing industry sectors
11	SI02	Num	Number of jobs in Trade, Transportation, and Utilities industry sectors
12	SI03	Num	Number of jobs in All Other Services industry sectors
13	createdate	Char	Date on which data was created, formatted as YYYYMMDD

Calculating Job Accessibility: Figure 2. Variable explanation for LODES data

Step 3: Measure the distance between the centroids of block groups.

- Generate geo-coordinates for centroids of each block group. Adding two columns in the attribute table, specifying the attributes as latitude and longitude.

- Right click on the selected column, use 'Calculate Geometry' to generate the latitude and longitude of the centroids.

The process for the example applications is shown in Calculating Job Accessibility: Figure 3.

OBJECTID	Shape	GEOID	GEOID	Low_Income_Jobs	latitude	longitude
1	Point	120570001011	120570001011	308	-82.413235	28.049612
2	Point	120570001012	120570001012	11	-82.403755	28.045385
3	Point	120570001021	120570001021	2821	-82.418066	28.038083
4	Point	120570001022	120570001022	8	-82.407321	28.039725
5	Point	120570001023	120570001023	0	-82.401609	28.040066
6	Point	120570001024	120570001024	74	-82.40229	28.03502
7	Point	120570002011	120570002011	122	-82.447034	28.050884
8	Point	120570002012	120570002012	23	-82.446997	28.045409
9	Point	120570002021	120570002021	167	-82.438704	28.049054
10	Point	120570002022	120570002022	231	-82.430364	28.050855
11	Point	120570002023	120570002023	5	-82.430391	28.045385
12	Point	120570003001	120570003001	12	-82.447008	28.041055
13	Point	120570003002	120570003002	2	-82.439263	28.040593
14	Point	120570003003	120570003003	30	-82.431052	28.041347
15	Point	120570003004	120570003004	64	-82.447084	28.035459

Calculating Job Accessibility: Figure 3. Calculating the geocoordinates for the centroid of each block group

- Generate a layer for the centroids.
- Export the geocoordinates as a table and add this table to the map by right clicking 'Display XY data' to generate the centroids (see Calculating Job Accessibility: Figure 4 and Calculating Job Accessibility: Figure 5).

Display XY Data ? x

Parameters Environments ?

Input Table
Centroids

Output Feature Class
Centroids_XYTableToPoint1

X Field
longitude

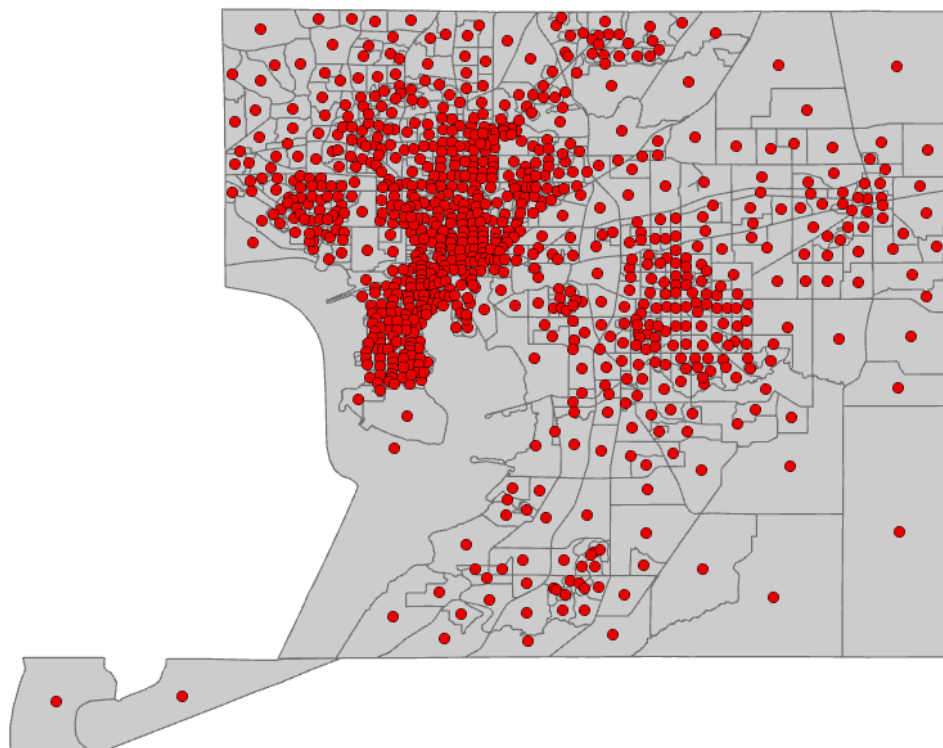
Y Field
latitude

Z Field

Coordinate System
GCS_WGS_1984

OK

Calculating Job Accessibility: Figure 4. Exporting the geocoordinates to generate the centroids



Calculating Job Accessibility: Figure 5. Generating the layer of centroids for block groups

Calculate the travel distance between different block groups. With the generated centroid layer, go to geoprocessing and type in 'generate near table' (see Calculating Job Accessibility: Figure 6). The OD matrix with the distance between centroids is generated. Remember to use 'Object

ID' (noting as IN_FID and NEAR_FID) to join the original table (GEOID) and keep geocode as the key to merge with the aggregated job count table.
The resulting OD matrix is 775,280.

Geoprocessing

Generate Near Table

Parameters Environments

Input Features
Centroids_HillsboroughCounty

Near Features
Centroids_HillsboroughCounty

Output Table
Hillsborough_County_LowIncome

Search Radius
Miles

☒ Location
☐ Angle
☐ Find only closest feature

Maximum number of closest matches
900

Method
Planar

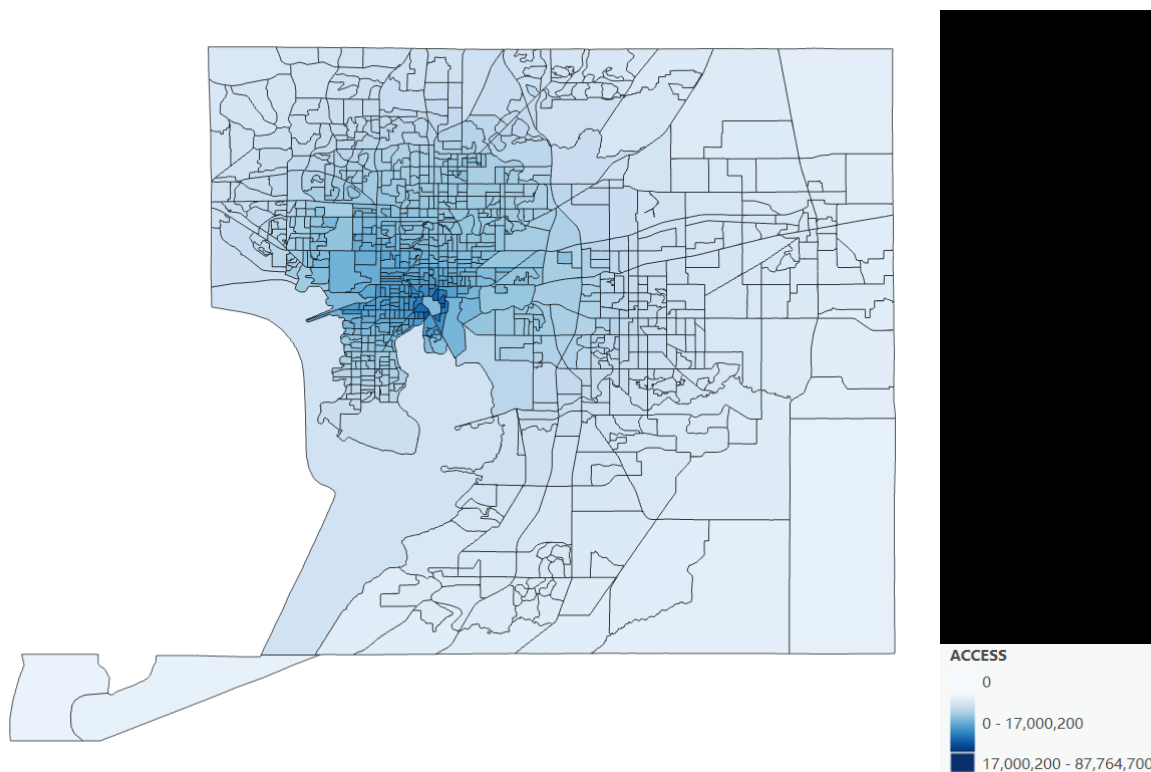
Run

Calculating Job Accessibility: Figure 6. Calculating travel distance between block groups

Step 4: Merge tables, calculate the living-wage jobs' accessibility, and interpret results.

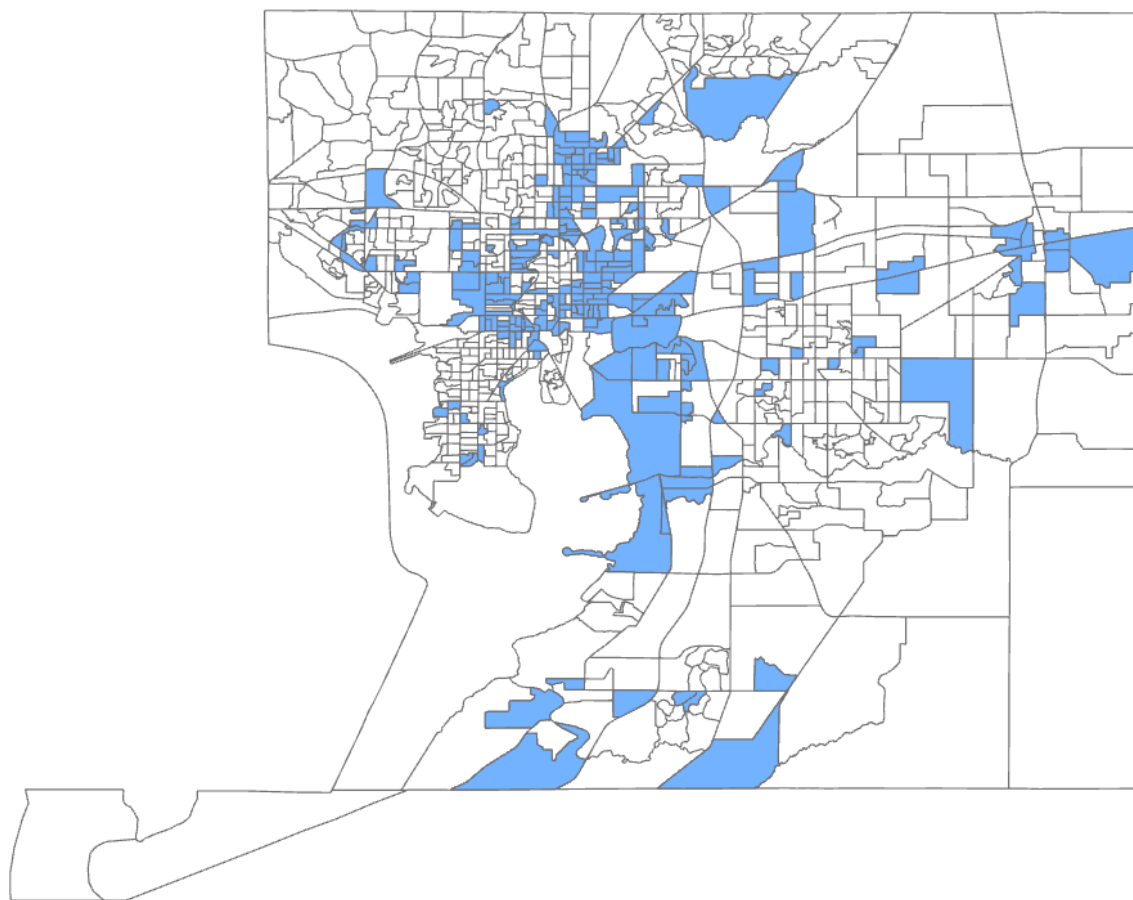
- Set 'geocode' as the key to merge the job count table (step 2) and travel distance table (step 3).
- Follow Hansen's accessibility model to calculate job accessibility for the block groups and aggregate for each block group.

The calculated job accessibility is shown in Calculating Job Accessibility: Figure 7. In this example application, most block groups have low access to mid- to high-wage jobs, and access decreases for block groups in suburban areas further away from downtown Tampa. These results indicate that people near downtown Tampa have better access to good jobs.

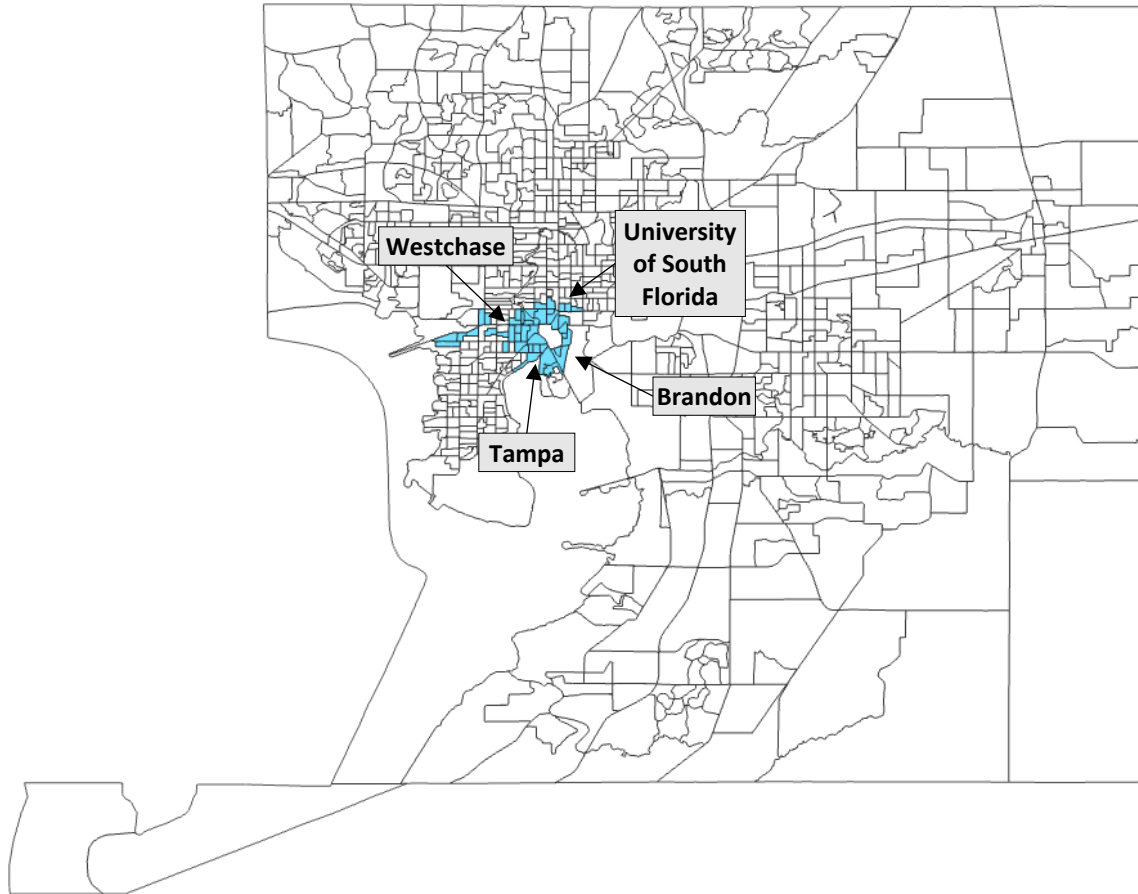


Calculating Job Accessibility: Figure 7. Calculated living-wage job accessibility distribution

- Identify block groups with more than 50% low-income households (see [Identifying Transit Underserved Areas](#) in this workbook for suggested steps to complete this analysis). The block groups in Hillsborough County with more than 50% low-income households (<\$35,000) are shown in Calculating Job Accessibility: Figure 8. The top 5% block groups with most of the mid- to high-wage jobs are clustered in downtown Tampa, Brandon, the University of South Florida, and Westchase areas as shown in Calculating Job Accessibility: Figure 9.



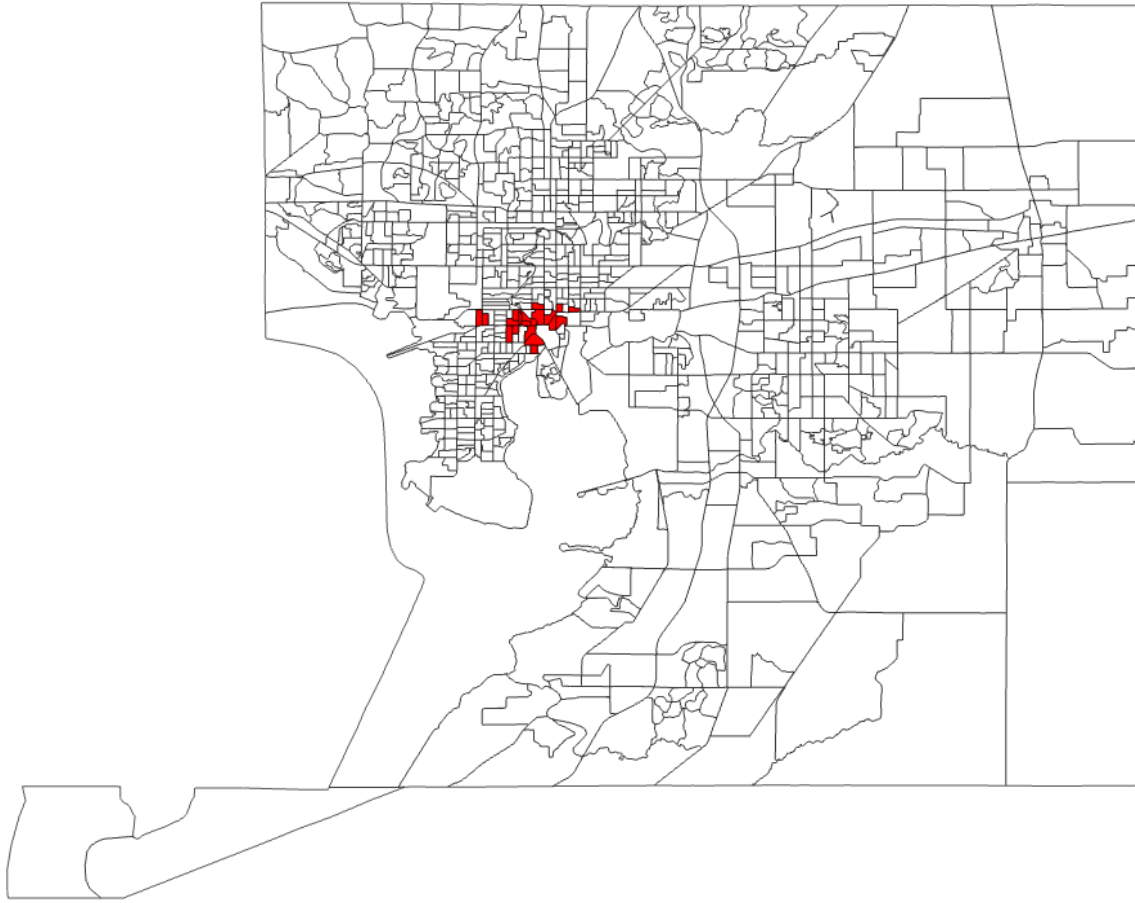
Calculating Job Accessibility: Figure 8. Block groups with more than 50% low-income households



Calculating Job Accessibility: Figure 9. Top 5% block groups with access to mid to high wage jobs

- Intersect the top 5% block groups with mid to high wage jobs with the block groups with more than 50% low-income households.

In the example application, 19 block groups are identified as having more low-income households with access to mid- to high-wage jobs, as shown in Calculating Job Accessibility: Figure 10.



Calculating Job Accessibility: Figure 10. Low-income households with access to living-wage jobs.

Step 5: Review the results. Based on your findings, develop a set of conclusions about transportation equity and access to better paying jobs in the study area. Include the transportation equity implications regarding access to better paying jobs in low-income areas and propose 2 to 3 solutions to address this access.

Step 6: Address the limitations of this approach

- Hansen's accessibility index is the most commonly used approach to measure accessibility. It is straightforward and easy to calculate. However, it has a simplified impedance function, such as travel distance and time, but, the impedance is far more complicated, such as the provision of transit, the access to highways, density, land use, time of day, and transportation policies. To more accurately calculate accessibility, a more advanced approach that is able to capture the utility of using different travel modes on different occasions can be used.
- Factors other than transportation also limit access to better paying jobs. Key among these is education level and experience.

Final Product

- Map series of:
 - Mid to high wage job accessibility distribution in the study area
 - Block groups with more than 50% of low-income households
 - Top 5% block groups with access to better paying jobs
 - Block groups that have more low-income households with access to better paying jobs
- 1-page discussion of results and conclusions:
 - Describe the results of the analysis, including limitations.
 - Discuss the transportation equity implications regarding access to higher-wage jobs in low-income areas.
 - Propose 2 to 3 solutions to address access to higher-wage jobs in low-income areas.

Evaluating Pedestrian Safety in Underserved Communities

Prerequisites

- Entry-level statistics
- GIS

Purpose

The purpose of this assignment is to help you understand how to count pedestrian-involved collision frequency and calculate pedestrian-involved collision risk based on collision data and census data. The example application for this assignment defines collision frequency, risk, and exposure. You will evaluate data to determine if block groups with higher percentages of low-income households are more exposed to pedestrian-involved collisions. During this assignment you will also examine whether areas with a high pedestrian collision frequency also have a high collision risk. At the end of this assignment you will:

- Be familiar with collision data.
- Learn how to count collision frequency and calculate collision risk.
- Differentiate between risk and exposure.
- Be able to interpret collision evaluation results and assess equity concerns related to collisions.

Instructions

Note:

- The example application for this assignment uses 2014 collision data for Florida
- Links to data are provided where available. Data are also provided as downloadable files.
- You will need access to ArcGIS Pro

Step 1: Familiarize yourself with relevant terms

- Conduct research to define collision frequency, exposure, and collision risk.

Step 2: Clean collision data.

- Open the data dictionary and review the content of each table.
- To clean the data, records with missing values (no geocoordinate) need to be removed. Ignore collision risk factors, such as speed, the time of collision, and lighting conditions, which are not essential to calculate collision risk. Therefore, to reduce the computation burden and simplify the data structure, pedestrian collisions need to be selected from the full data. With these objectives in mind, complete the following tasks:
 - Open the data
 - Select the pedestrian collision records. The attribute to decide whether it is a pedestrian-involved collision is 'Non-Motorist Description Code', and '1' and '2' indicate a pedestrian collision, as shown in Evaluating Pedestrian Safety: Figure 1.
 - Select pedestrian-involved collisions in Hillsborough County, and '03' indicating Hillsborough, as shown in Evaluating Pedestrian Safety: Figure 2.

Skills	
Analysis	★ ★ ★ ★ ★
Critical thinking	★ ★ ★
Problem solving	★ ★ ★

6. Non-Motorist Description Code

- 1 Pedestrian
- 2 Other Pedestrian (wheelchair, person in a building, skater, pedestrian conveyance, etc.)
- 3 Bicyclist
- 4 Other Cyclist
- 5 Occupant of Motor Vehicle Not in Transport (Parked, etc.)
- 6 Occupant of a Non-Motor Vehicle Transportation Device
- 7 Unknown Type of Non-Motorist

Evaluating Pedestrian Safety: Figure 1. The code to differentiate collision types

County	HSMV Code	DOT Code	County	HSMV Code	DOT Code
Hamilton	56	32	St. Johns	20	78
Hardee	30	06	St. Lucie	24	94
Hendry	49	07	Sumter	44	18
Hernando	40	08	Suwannee	31	37
Highlands	27	09	Taylor	37	38
Hillsborough	03	10	Union	63	39
Holmes	51	52	Volusia	08	79
Indian River	32	88	Wakulla	65	59
Jackson	25	53	Walton	36	60
Jefferson	46	54	Washington	50	61
Lafayette	62	33			
Lake	12	11	Unknown	68	
Lee	18	12			

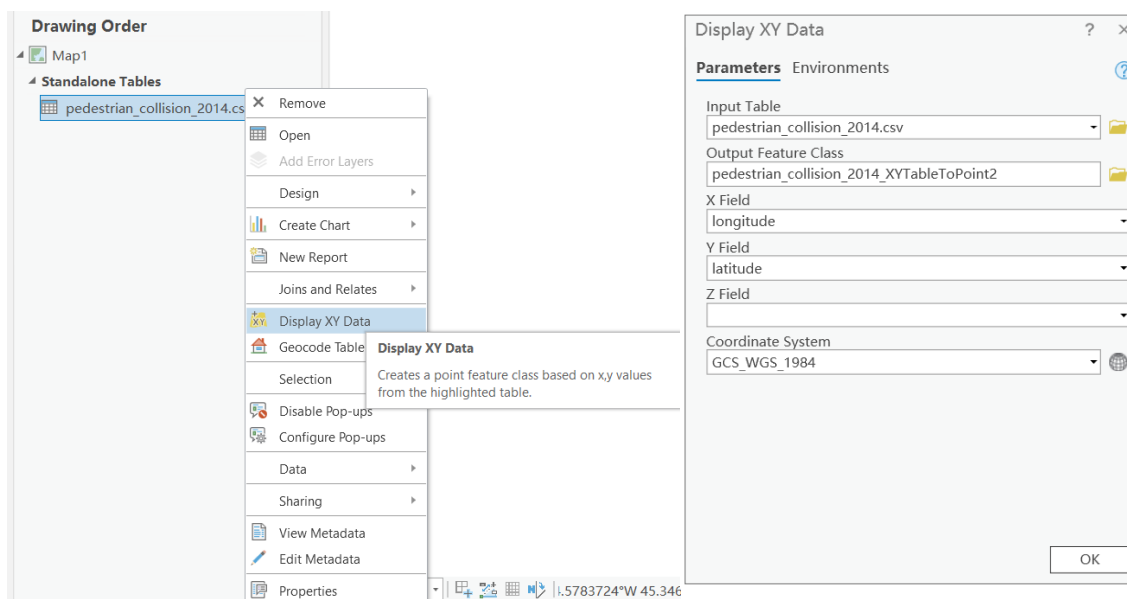
Evaluating Pedestrian Safety: Figure 2. The code to identify the study area

The preliminary results for Hillsborough County show the following:

- Pedestrian-involved collisions represent 4.91% of all collisions in Florida, $30524/621717=4.91\%$.
- About 1/3 of pedestrian-involved collisions were geocoded in Florida, $9490/30524=31.09\%$.
- The number of geocoded pedestrian-involved collisions in Hillsborough County in 2014 was 68.

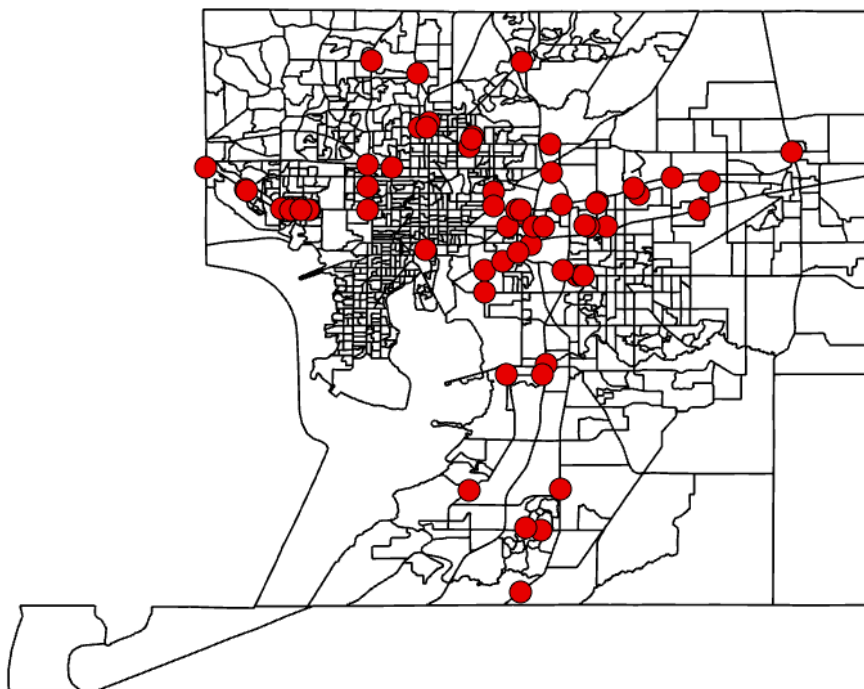
Step 3: Implement geo-spatial analysis

- Import collision data into GIS Pro.
- Add clean pedestrian-involved collision data to the map and right click the csv file to choose 'Display XY Data', as shown in Evaluating Pedestrian Safety: Figure 3.



Evaluating Pedestrian Safety: Figure 3. Converting geocoordinates to points

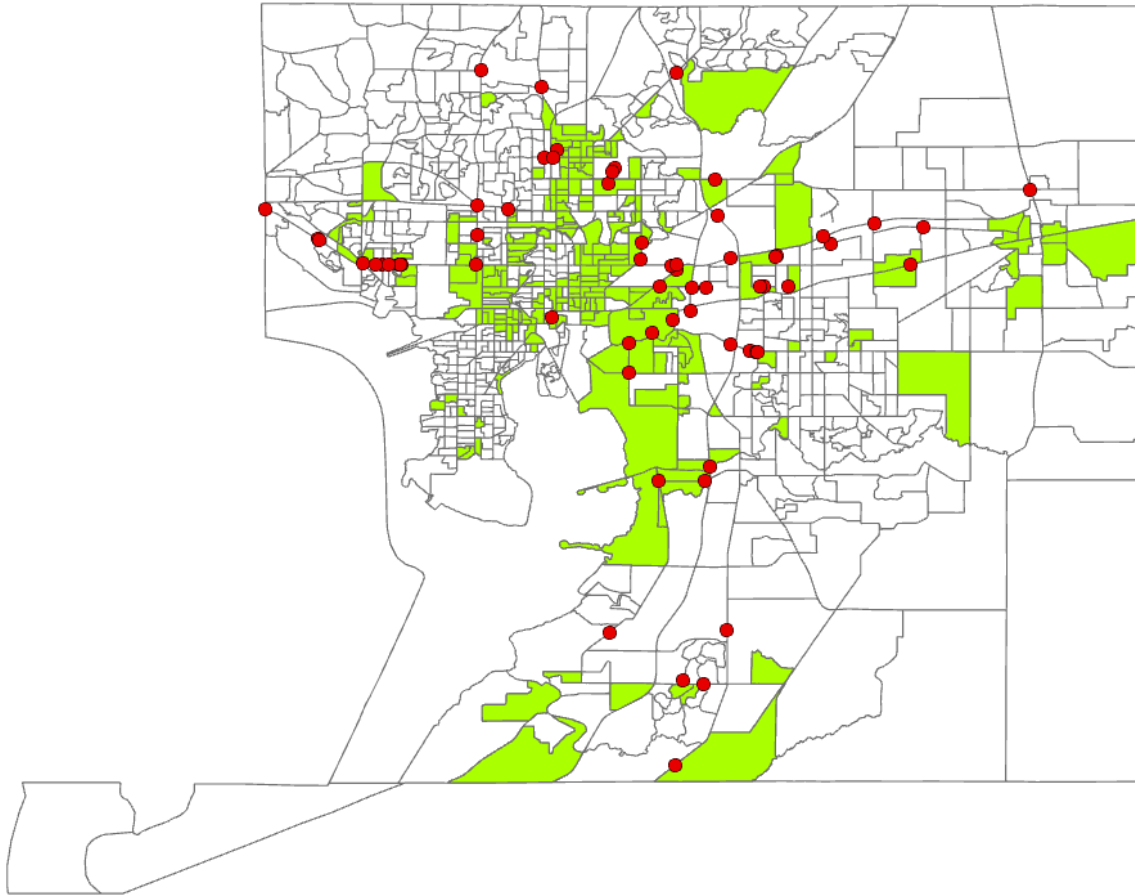
- Next, click 'OK', and the XY table will be converted to points, as shown in Evaluating Pedestrian Safety: Figure 4.



Evaluating Pedestrian Safety: Figure 4. The location of pedestrian-involved collisions

- Use the method provided in this workbook for [Identifying Transit Underserved Areas](#) to identify and map the block groups with high percentages of low-income households.
- Spatially overlay pedestrian-involved collision data with block groups with high percentages of low-income households (done in previous assignments).

- The result is shown in Evaluating Pedestrian Safety: Figure 5. Use 'spatial-join' to further verify the numbers.



Evaluating Pedestrian Safety: Figure 5. Pedestrian-involved collisions & low-income households

- In geoprocessing, choose 'SpatialJoin', set up 'Target Features' and 'Join Features', name the new layer as 'low_income_BG_SpatialJoin', click 'Run'.
- Open the 'Attribute Table' and select the 'Joint Count' column, right click, and choose 'Statistics'.

The descriptive statistics shown in Evaluating Pedestrian Safety: Figure 6 demonstrate that the pedestrian-involved collision frequency is higher in block groups with a higher percentage of low-income households than in other areas (about 1.29 times more).

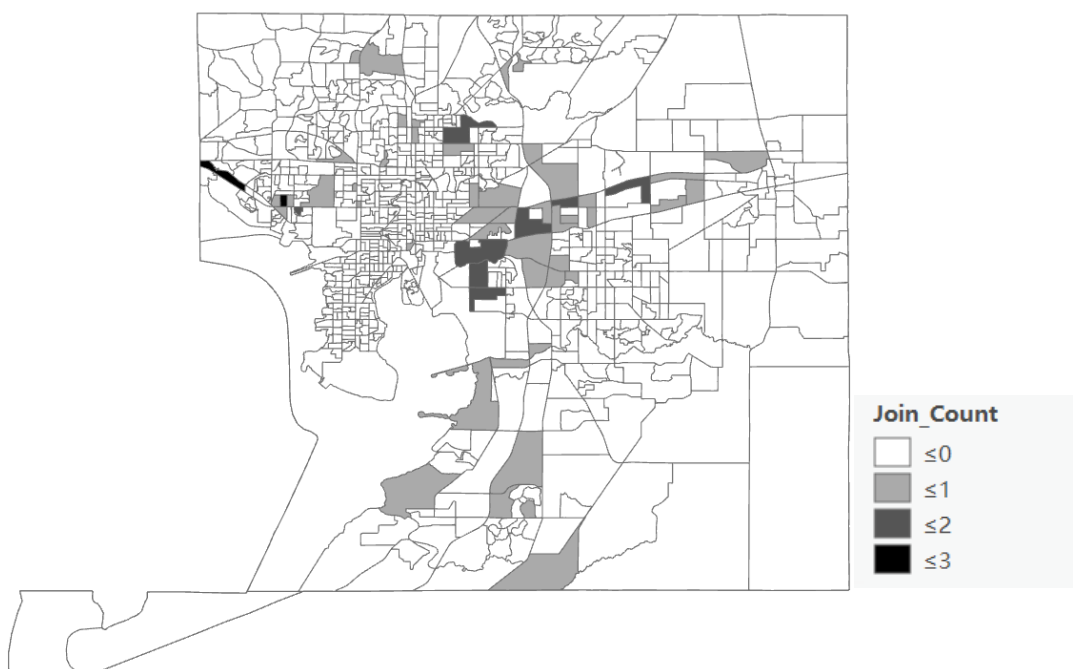
To assess the results more accurately, a more rigorous research design is needed. Timely reporting and better geocoding efforts are needed for pedestrian-involved collisions.

Statistics		
	Dataset	Selection
<input checked="" type="checkbox"/> Mean	0.077185017	0.0995670996
<input type="checkbox"/> Median	0	0
<input type="checkbox"/> Std. Dev.	0.3211333248	0.3407788822
Count	881	231
Min	0	0
Max	3	2
Sum	68	23
Nulls	0	0
Skewness	4.895187018	3.610659028
Kurtosis	30.8832076537	16.2957381485

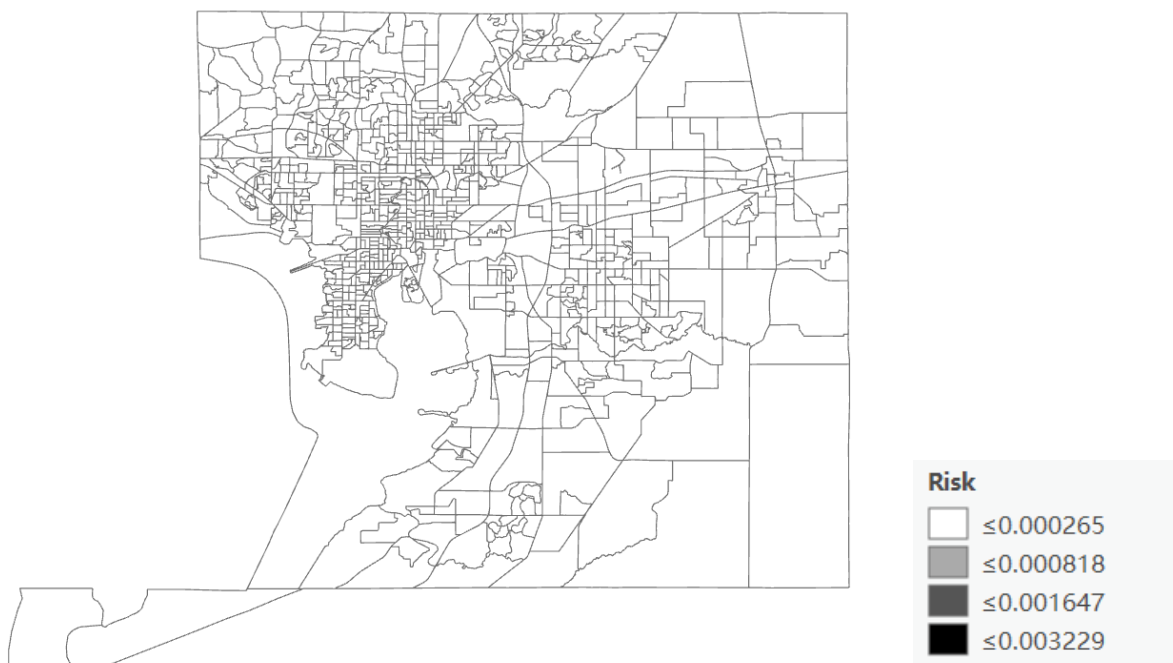
Evaluating Pedestrian Safety: Figure 6. Collision frequency summary

Step 4: Calculate pedestrian-involved collision risk

- To calculate collision risk, the census population dataset and the exposure measurement needs to be obtained. Pedestrian-involved collision risk equals collision frequency divided by the number of people in the block group. The calculated pedestrian collision frequency and risk are presented in Evaluating Pedestrian Safety: Figure 7 and Evaluating Pedestrian Safety: Figure 8. As shown in these figures, some areas with higher population density have more pedestrian collisions in Hillsborough County in 2014 (see Evaluating Pedestrian Safety: Figure 7). However, when dividing by total population, the variation of collision risk across areas is very small (see Evaluating Pedestrian Safety: Figure 8).



Evaluating Pedestrian Safety: Figure 7. Pedestrian collision frequency in the study area



Evaluating Pedestrian Safety: Figure 8. Pedestrian collision risk in the study area

Block groups with higher percentages of low-income households present 1.30 times higher risk of being involved in pedestrian collisions than other block groups (see Evaluating Pedestrian Safety: Figure 9).

Statistics		
	Dataset	Selection
<input checked="" type="checkbox"/> Mean	0.0000597197	0.0000775375
<input type="checkbox"/> Median	0	0
<input type="checkbox"/> Std. Dev.	0.0002760865	0.0002838562
Count	881	231
Min	0	0
Max	0.0032292788	0.001998002
Sum	0.0428787509	0.0141893562
Nulls	163	48
Skewness	6.138821685	4.1650430872
Kurtosis	48.1462891616	21.3212735347

Evaluating Pedestrian Safety: Figure 9. Comparison of pedestrian collision risk

Step 5: Review the results. Based on your findings, develop a set of conclusions about pedestrian safety in the study area. Include the transportation equity implications regarding pedestrian safety in underserved communities and propose 2 to 3 solutions to address pedestrian safety in these communities.

- The analysis of the collision records for Hillsborough County suggest that block groups with high percentages of low-income households have an approximately 1.3 times higher likelihood of collision frequency and risk in comparison to all block groups.

Step 6: Address the limitations of this approach

- Collision risk needs to be carefully interpreted. For example, population density in some job centers is low, while the intensity of human activities in these job centers is high.
- Counter-intuitive results may be identified, which need further investigation and explanation.
- Where residents live does not indicate that their activity space is constrained to that block group.
- To gain deep insights of what risk factors contribute to the occurrence of collisions, more disaggregate analyses are encouraged. For example, these factors may include human errors (i.e. distraction and intoxication, speeding and texting), roadway environment (disconnected streets, insufficient provision of sidewalks, slippery road surfaces), traffic management (inadequate traffic calming, high speed limit, lighting conditions), and natural factors (bad weather).

Final Product

- Map series of:
 - The locations of pedestrian-involved collisions in the study area
 - Pedestrian-involved collisions overlayed with high percentage of low-income households
 - Pedestrian collision frequency in the study area
 - Pedestrian collision risk in the study area
- 1-page discussion of results and conclusions
 - Describe the results of the analysis, including limitations.
 - Discuss the transportation equity implications regarding pedestrian safety in underserved communities.
 - Propose 2 to 3 solutions to address pedestrian safety in underserved communities.

Equity Analysis of Shared Micromobility

Prerequisites

GIS

Purpose

The purpose of this assignment is to help you understand how to evaluate the equity implications of a new shared micromobility service. The assignment will show you how to:

- Analyze third party shared mobility data to estimate accessibility
- Create spatial maps of shared micromobility (SMM) usage
- Identify equity concerns from deployment of a SMM service

Instructions

Note:

- The example application for this assignment uses 2019 data for the City of Austin, Texas
- Links to data are provided where available.
- You will need access to ArcGIS Pro

Step 1: Review the SMM data from the City of Austin <https://data.austintexas.gov/Transportation-and-Mobility/Shared-Micromobility-Vehicle-Trips/7d8e-dm7r/data>. This dataset contains shared micromobility vehicle trip data reported to the City of Austin Transportation Department as part of the Shared Small Vehicle Mobility Systems operating rules.

Note that the official trip reporting metrics only include trips which meet the following criteria:

- Trip distance greater than or equal to .1 miles and less than 500 miles
- Trip duration less than 24 hours

Step 2: Using the Filter option select the trips with a *start time* between **01/01/2019 12:00:00 AM** and **01/31/2019 11:59:00 PM**.

Step 3: Using the Export > CSV for Excel option download the data to your local computer.

Step 4: Create a map of Austin Bikeways and Multi-Use Paths using public GIS file downloaded from ArcGIS Online:

https://services.arcgis.com/0L95CJ0VTaxqcmED/arcgis/rest/services/TRANSPORTATION_bicycle_facilities/FeatureServer.

- Add a layer of **council districts** on top of the map:
https://services.arcgis.com/0L95CJ0VTaxqcmED/arcgis/rest/services/BOUNDARIES_single_member_districts/FeatureServer

Step 5: Calculate the number of trips that originated in each council district during the specified time period (**01/01/2019 12:00:00 AM** and **01/31/2019 11:59:00 PM**).

Step 6: Calculate the number of trips that ended in each council district during the specified time period (**01/01/2019 12:00:00 AM** and **01/31/2019 11:59:00 PM**).

Skills

Analysis ★ ★ ★ ★ ★

Critical thinking ★ ★ ★

Research ★ ★ ★

Step 7: Calculate the origin-demand matrix for the SMM trips. The origin-demand matrix should be a two-dimension table where the rows show the origin districts and the columns shows the destination districts.

Step 8: Read the district-by-district analysis report by the Austin City Council:

<https://housingworksAustin.org/wp-content/uploads/2021/06/2020-HWA-District-Analysis.pdf>

- Using the information provided in this report, compare the median family income (MFI) and % People of Color (POC) statistics for the different districts in Austin (see the executive summary page 2).

Step 9: Make a correlation between:

- The number of trips starting in each district and the socio-demographic metrics as determined in step #7.
- The number of trips ending in each district and the socio-demographic metrics as determined in step #7.

Step 10: Based on the correlations, make a note of the following to use in a reflection paper:

- The level of availability for bikeways and multi-use paths in the low income and high % POC districts (use the information provided on the page titled “Austin at a Glance” in the district-by-district analysis to identify the threshold for low income and high % POC)
- Possible reasons for low SMM use in certain districts
- System gaps that cause connectivity and accessibility issues for SMM
- Two strategies to remove the sources of inequitable access to SMM. You can refer to the following guide for ideas: <https://nacto.org/sharedmicromobilityguidelines/>

Final Product

Write a 1-page reflection paper describing your observations regarding equitable access to SMM. Include the following points in your paper:

1. The level of availability for bikeways and multi-use paths in the low income and high % POC districts (use the information provided on the page titled “Austin at a Glance” in the district-by-district analysis to identify the threshold for low income and high % POC)
2. Possible reasons for low SMM use in certain districts
3. System gaps that cause connectivity and accessibility issues for SMM
4. Two strategies to remove the sources of inequitable access to SMM.

Include an appendix with the following items:

1. Map of bike facilities of Austin with the overlay of council districts.
2. Origin-Demand matrices of SMM trips using the downloaded data

Equitable Positioning of Electric Vehicle (EV) Charging Stations

Purpose

At the end of this assignment, you will be able to:

- Identify concerns related to environmental justice (EJ) and electric vehicles (EVs) using a map database
- Compare the positioning of EV charging locations in terms of equitable access and extent of impact
- Recommend optimal location for siting EV charging stations considering equity

Skills	
Analysis	★ ★ ★ ★ ★
Problem solving	★ ★ ★
Research	★ ★ ★ ★

Instructions

Step 1: Research EV adoption, infrastructure and charging facilities, and equity issues related to EV (be sure to use credible sources and cite and reference all source) and synthesize your findings into 1 – 2 paragraphs. Your synthesis should describe the following:

- The relationship between EJ and EV. This source provides some background information on EJ <https://www.epa.gov/environmentaljustice/learn-about-environmental-justice>
- The impact of different EV charging facilities such as Level 1, Level 2, Level 3 (DC Fast Charging) in providing convenience of EV usage.
- Range anxiety and how access to affordable charging locations can reduce the range anxiety of users.
- The relationship between EV ownership, investment in EV charging infrastructure and, rate of EV adoption.
- Some of the key barriers for purchasing EV.
- Why low-income neighborhoods may have lower densities of EV ownership.

Step 2: Review the map of CalEnviroScreen 4.0

<https://experience.arcgis.com/experience/11d2f52282a54ceebcac7428e6184203/>. The results show which California communities are disproportionately burdened by multiple sources of pollution.

- Take a snapshot of Shafter, CA (Kern County) with the pollution burden indicator.
- Use the snapshot to identify the areas in Shafter, CA that are disproportionately burdened by pollution.

Step 3: Using the Alternative Fueling Station Locator

<https://afdc.energy.gov/stations/#/find/nearest?location=shafter>, find the EV charging stations in Shafter, CA

Step 4: Review both maps and compare the locations of EV charging stations and the areas disproportionately burdened by pollution. Make a note of your observations.

Step 5: Develop a set of recommendations (3 to 5) for optimal locations for siting new EV charging stations to address equity gaps in EV access and reduce transportation-related air pollution in areas disproportionately burdened by pollution.

Final Product

Write a 1-page report addressed to the Air Pollution Control District that lays out the facts for EV charging station deployment as a means to reduce transportation related air pollution. In the report, include the following:

1. 1 – 2 paragraphs synthesizing your research findings on EV adoption, infrastructure and charging facilities, and equity issues related to EV.
2. Your comments on the positioning of existing EV charging locations using the findings from your review of the CalEnviroScreen 4.0 map and the Alternative Fueling Station Locator.
3. Your recommendations for optimal locations for siting new EV charging stations to address equity gaps in EV access and reduce transportation-related air pollution in areas disproportionately burdened by pollution.

Instructor Notes

Social Justice in Transportation Essay

You may encourage students to write about other recent topics (using resources no more than 5 years old). You may also provide a list of prompts more closely related to your discipline or broader course content.

Equity in Transportation History

This assignment can be completed in two ways:

1. You can assign a city or cities to each student or provide a list of cities for the students to choose from for their timeline and story. These approaches are helpful if you can communicate with the City Planning Department ahead of time and work collaboratively with City staff in supporting the students as they complete the assignment.
2. Students can select a city of their choice for their timeline and story. Although this approach gives students more autonomy and will produce a greater diversity of final products, students may encounter issues contacting the appropriate staff person or gaining access to necessary information.

The assignment can be completed as individual work or as a group project.

Comparing Equity Components in Transportation Plans

Consider having each student or a few students present their findings for class discussion.

Commentary on Equity Issues in Transportation

Encourage students to think critically about the points discussed during the presentation and consider the presentation from multiple viewpoints (e.g. users of the transportation system, transportation professionals, elected officials, etc.).

Data Sources for Equity Assessments

This assignment can be completed as a general data collection exercise using national sources, or generalized information for potential local sources.

The assignment can also be used as an initial step for a larger project that inventories the transportation conditions in an actual community or study area. This type of assignment can be completed in two ways:

1. You can assign an area (community, neighborhood, or corridor) to each student, or provide a list of areas for the students to choose from for their data sources review. These approaches are helpful if you can communicate with local agency staff in a local Planning or Transportation Department ahead of time and work collaboratively with agency staff in supporting the students as they complete the assignment.
2. Students can select an area (community, neighborhood, or corridor) of their choice for their data sources review. Although this approach gives students more autonomy and will produce a greater diversity of final products, students may encounter issues contacting the appropriate staff person or gaining access to necessary information.

Developing a Community Profile

This type of assignment can be completed in two ways:

1. You can assign an area (city, unincorporated area, or neighborhood) to each student. Or you can provide a list of areas for the students to choose for their data sources review. These approaches are helpful if you can communicate with local agency staff in the Planning and/or Transportation Department providing services for that area ahead of time and work collaboratively with agency staff in supporting the students as they complete their profiles.
2. Students can select an area (city, unincorporated area, or neighborhood) of their choice for their profiles. Although this approach gives students more autonomy and will produce a greater diversity of final products, students may encounter issues contacting the appropriate staff person or gaining access to necessary information.

Ensure that the assigned or selected area is well defined geographically in ACS Data, Census Data, or local agency data (e.g., ACS data defines geography types as County, County Subdivision, Place, Census Tract, Zip Code Tabulation Area, Metropolitan/Micropolitan Statistical Area, American Indian Area/Alaska Native Area/Hawaiian Home Land).

If resources are available, this project can be completed in collaboration with community organizers and/or interested community members.

The list of sociodemographic information provided in the assignment is extensive. Before students start their research, you can ask students to select a predetermined number of sociodemographic indicators (e.g., 5), or you can identify which indicators the students will include in their community profile.

To help students in identifying underserved populations (i.e., the threshold method), you can ask students to identify community-wide, county-wide, or regional averages for the variables to compare with the study area.

Assessing the Transportation Needs of Underserved Communities

1. The assignment can be completed as individual work or as a group project.
2. You can assign an area (community, neighborhood, or corridor) to each student or group. Or you can provide a list of areas for the students or groups to choose from for their assignment.
3. If resources are available, this audit tool can be completed in collaboration with local agency staff, community organizers, and/or interested community members. If this approach is used, ask students to interview a sample of community members using the Community Members section of the Transportation Equity Audit Tool and the remaining sections. Results should then be aggregated and analyzed to identify trends (see After the Audit in the [Transportation Equity Toolkit](#)).
4. This assignment can be offered as a larger project with three parts.
 - a. Part 1 would be the assessment of the community characteristics (see [Developing a Community Profile](#) in this workbook).
 - b. Part 2 would include the audit tour and/or community member interviews to collect information on transportation conditions.
 - c. Part 3 would involve the analysis of the audit results.

Each part would be combined in the final product.

Community Engagement Activity

1. The class may refer to local government websites to find opportunities for public engagement events.
2. Students are welcome to pick an event within the scope of a community engagement that interests them.
3. The assignment could be designed to support a service-learning course in which students volunteer and participate in a community engagement process.
4. To familiarize students with current research on community engagement, this assignment can be expanded to include a research paper as the final product.

Neighborhood Mapping

1. Students can choose their own sites for the neighborhood maps and posters. You may need to provide support for students as they select their sites. Based on class size and local context, the instructor can also list 4-5 neighborhoods for students who cannot decide which study site to choose.
2. The assignment is designed to be a group project, but it can also be completed as individual work. This decision is up to the discretion of the instructor
3. The assignment can have different emphases when assigned to different modules. For example, if assigned to transportation and public health modules, the instructor can ask students to pay more attention to pedestrian safety; if assigned to evaluating travel patterns and behaviors, students can focus more on the travel behavior of street users.

NOTE: The assignment can also be used as an initial step for a larger project that includes a [walk audit](#).

Walk Audit

1. Students can choose their own roadways for the audits. You may need to provide support for students as they select their roadways. Based on class size and local context, the instructor can also list 4-5 roadways for students who cannot decide which study site to choose.
2. The assignment can be completed as individual work or as a group project.
3. Rather than having students select from the provided list of resources, you may choose to select the appropriate worksheet(s) from the resource list or use a worksheet from another source.
4. The assignment can have different emphases when assigned to different modules. For example, if assigned to transportation and public health modules, the instructor can ask students to pay more attention to pedestrian safety; if assigned to evaluating travel patterns and behaviors, students can focus more on the travel behavior of street users.

Urban Planning Cooperative Game

1. As the instructor, you may need to serve as a mediator if the breakout groups are at an impasse.
2. The stakeholder groups and breakout groups are best facilitated during class time. The final reflection paper is an individual assignment and can be completed as an out-of-class assignment.
3. Instructors can develop activities other than a BRT plan, depending on the local transportation projects available, and invite local project teams to the class to share their experiences.
4. This activity requires students to clearly understand the role and interests of different stakeholder groups. Instructors can provide real-world examples and resources to support students' understanding of the roles of each stakeholder group and additional resources on conflict resolution and negotiation strategies.

5. It may be helpful to provide students with articles and/or documents for recent/current projects to help familiarize them with the concept explored in this assignment. For example, this article gives an example of the process of a BRT strategic plan: Wong and Fisher (2010). Developing a Bus Rapid Transit Strategic Plan for San Jose and Silicon Valley, California. Transportation Research Record, 2145-04, pp.30-39. <https://journals.sagepub.com/doi/pdf/10.3141/2145-04>

Case Study Think-Pair-Share

1. The process of assigning projects can be done in various ways. Possible methods include:
 - a. Allow the students to choose their own transportation project or policy. This method gives students more autonomy and will produce a greater diversity of final products.
 - b. Assign preselected transportation projects or policies to each pair of students. This method ensures the projects or policies highlight specific issues relative to the course content as selected by the instructor.
 - c. Provide a bank of transportation projects or policies for students to choose from. This method ensures the projects and policies highlight specific equity issues, but still allows students to choose topics or locations that are of interest to them.
2. The presentations can be formal or informal, with or without slides, shared with the entire class, or in small groups, at the discretion of the instructor.

Socio-Economic Mobility Report

This assignment can be completed in two ways:

1. You can assign an agency or agencies to each student, or you can provide a list of agencies for the students to choose from for their report. These approaches are helpful if you can communicate with the agency staff ahead of time and work collaboratively with staff in supporting the students as they complete the assignment.
2. Students can select an agency of their choice for their report. Although this approach gives students more autonomy and will produce a greater diversity of final products, students may encounter issues contacting the appropriate staff person or gaining access to necessary information.

Policy Brief on Transportation and Health

Students can choose to write their policy briefs in one of two ways:

1. They can write an advocacy brief that argues in favor of a stated course of action
1. They can write an objective brief that provides neutral information on the topic

Policy Brief on Transportation Funding and Equity

Students can choose to write their policy briefs in one of two ways:

1. They can write an advocacy brief that argues in favor of a stated course of action
2. They can write an objective brief that provides neutral information on the topic

Identifying Transit Underserved Areas

1. This assignment is more appropriate for graduate students who have successfully completed entry level statistics and GIS courses. This assignment involves multiple analytical steps, including finding the data, building the map, sorting income and identifying low-income groups, overlaying bus stop

data with census block groups, calculating bus stop density, identifying transit underserved areas, and discussing results.

2. Instructors should be aware of biased results triggered by modifiable areal unit problem.
3. This assignment is demonstrated with an example application using data for Hillsborough County, Florida. Once students have demonstrated an understanding of the steps to complete the analysis, you may consider assigning them a similar assignment using data from a study area of your choice.

Calculating Job Accessibility

1. This analysis is split into following steps: understand the idea of accessibility and learn how to calculate job accessibility, be familiar with census longitudinal employment household dynamics data, map accessibility, and discuss related equity concerns related to job accessibility
2. Accessibility is one of the most important indicators that measures the quality of travel. Accessibility measures how the transportation and land use system provides individuals access to various human activity spaces with efficiency and ease. Accessibility presents a number of opportunities given impedance to reach destinations with different travel modes and costs. This assignment is designed to help students measure job accessibility and assess equity issues in accessing jobs for low-income households.
3. This assignment is demonstrated with an example application using data for Hillsborough County, Florida. Once students have demonstrated an understanding of the steps to complete the analysis, you may consider assigning them a similar assignment using data from a study area of your choice.

Evaluating Pedestrian Safety in Underserved Communities

1. This exercise is designed to help students become familiar with collision data and census population data, differentiate collision frequency, risk, and exposure, and discuss their related equity implications. The analytical process of this exercise includes being familiar with the terms, such as collision frequency, risk, exposure, risk factors, cleaning data, implementing geo-spatial analysis, calculating related indexes and discussing results. Some of these terms are defined below:
 - a. Collision frequency (in count): the number of collisions, such as between passenger cars and pedestrians, counted in each spatial analytical unit, such as block groups, road segments, and intersections.
 - b. Exposure (in count): in road safety analysis, exposure is the situation that presents some risk of involvement in a collision. Alternatively saying, how many people are exposed to a collision. For example, the vast majority of humans walk on streets, and both population and traffic volume are considered exposure measurements that create a risky environment for collisions. It is worth noting that not all exposure measurements of different travel modes are easy to quantify, such as bicycle volume.
 - c. Collision risk: the pedestrian collision frequency in rural areas may not be high due to a limited number of residents; however, the collision risk may not be low if exposure is considered. In contrast, the pedestrian collision frequency in downtown areas can be high, while the collision risk may not be high. Collision risk is measured by collision frequency divided by corresponding exposure measurements.
2. Before starting the analysis, students need to be aware of several limitations of pedestrian and bicycle collision data. Pedestrian and bicycle collisions are seriously under-reported, especially those involving minor injuries and therefore, a great proportion of collision data for pedestrians are not geocoded. As a result, pedestrian and bicycle collision frequency tend to be underrated and collision risk tends to be underestimated.

3. This assignment is demonstrated with an example application using data for Hillsborough County, Florida. Once students have demonstrated an understanding of the steps to complete the analysis, you may consider assigning them a similar assignment using data from a study area of your choice.

Equity Analysis of Shared Micromobility

1. The filter in Step 2 will yield 361,549 trips
2. The downloaded data is saved in the course companion site. The filename is Shared_Micromobility_Vehicle_Trips.csv.
3. A sample of the bike facility map is shared in the course companion site.
4. The students may not be able to access ArcGIS Online through their institution. In that case, please provide them with the map that is included in the companion site.
5. You may need to provide students a refresher on the use of pivot tables in Microsoft Excel to steps 5-7. Please check the companion site for the excel solution.

Equitable Positioning of Electric Vehicle (EV) Charging Stations

1. There are several sources that can provide students with additional background on Environmental Justice and address the relationship between Environmental Justice and Electric Vehicles. Some of these resources are provided in the readings for the Transportation Equity Curriculum Guidance Document.
2. An EV charging station has higher potential to reduce pollution when the amount of Internal Combustion Engine (ICE) vehicle miles replaced by EV miles is higher as a direct influence of the EV station. For this assignment, ask students to assume that an EV charging station located in a particular zone will serve both the EV owners in those zones and the vehicles that pass through the zone.

Sample Rubric

Criterion	Excellent	Good	Poor
Analysis	Identifies applicable data, uses appropriate analysis methods (qualitative and/or quantitative), and correctly interprets results.	Can identify some applicable data, uses appropriate analysis methods (qualitative and/or quantitative), and interprets results, but with some errors.	Unable to identify appropriate data, uses inappropriate analysis methods (qualitative and/or quantitative), and/or inaccurately interprets results.
Collaboration/ Teamwork	Works well with a team and demonstrates a strong ability to communicate, coordinate, and cooperate with peers.	Works reasonably well with a team and demonstrates adequate ability to communicate, coordinate, and cooperate with peers.	Does not work well with a team and is unsuccessful in communicating, coordinating, and cooperating with peers.
Communication	Demonstrates exceptional professionalism and attention to detail in written, oral, and/or graphic communication.	Is professional and is fairly detail-oriented in written, oral, and/or graphic communication, but may have a few minor inconsistencies or errors.	Demonstrates little to no professionalism and minimal attention to detail, resulting in multiple inconsistencies and errors of varying severity.
Creativity	Demonstrates divergent thinking and successfully applies innovative approaches when completing the assignment.	Demonstrates some “out-of-the-box” thinking and attempts to apply some innovative approaches when completing the assignment.	Displays little to no creativity or innovation when completing the assignment.
Critical thinking	Demonstrates thorough comprehension of the material and can effectively conceptualize, apply, and/or evaluate information.	Demonstrates a general understanding of the material, but is not fully successful in conceptualizing, applying, and/or evaluating information.	Does not demonstrate an understanding of the material and is unable to conceptualize, apply, and/or evaluate information.
Decision-making	Is able to define and assess a problem and apply effective reasoning to make well-informed decisions that consider a	Is able to define and assess a problem. Decisions may be appropriate, but are not well justified or only consider one (or a small	Is not able to define and assess the problem. Decisions do not reflect appropriate responses to the problem.

Criterion	Excellent	Good	Poor
	multitude of possible outcomes.	number of) possible outcome(s).	
Negotiation	Is well prepared, highlights important points during the negotiation process, and applies effective negotiation strategies that allow for a balanced problem-solving process.	Is somewhat prepared, contributes to the discussion, and adequately uses some negotiation strategies.	Is not prepared, does not contribute to the discussion in a manner that is productive, and does not demonstrate an understanding of negotiation processes.
Problem solving	Demonstrates a strong ability to identify, define, and assess complex problem(s). Exhibits the use of logical reasoning to identify one or more solution(s). Is able to evaluate possible solutions for feasibility and potential consequences.	Demonstrates some ability to identify, define, and assess complex problem(s). Is able to identify one or more solutions but is only somewhat effective in evaluating solutions.	Is unable to identify, define, and/or assess problems or identify solutions.
Public speaking/ Presenting	Visual presentations are well organized, properly formatted, and visually appealing. Oral presentations are engaging and articulate and effectively communicate the project.	Visual presentations are adequately organized and formatted and have some visually appealing elements. Oral presentations are fairly engaging and articulate and communicate the project.	Visual presentations are not well organized, properly formatted, or visually appealing. Oral presentations are not engaging nor articulate, or do not effectively communicate the project.
Research	Effectively uses appropriate research methods and demonstrates a strong ability to communicate, organize, and synthesize information from credible and appropriate sources to skillfully	Adequately uses research methods and demonstrates a reasonable ability to communicate, organize, and synthesize information from credible and appropriate sources to connect most conclusions to evidence.	Does not demonstrate an understanding of research methods. And/or Does not cite or reference sources. And/or

Criterion	Excellent	Good	Poor
	connect all conclusions to evidence.		Does not connect any conclusions to evidence.
Strategic thinking	Demonstrates adaptability in achieving identified goals and the capacity to holistically comprehend the implications of proposed actions.	Demonstrates some adaptability in achieving identified goals and some ability to comprehend the implications of proposed actions.	Is not able to achieve identified goals and/or does not comprehend the implications of proposed actions.

References

Planning Accreditation Board. (n.d.). Sample rubrics. <https://www.planningaccreditationboard.org/wp-content/uploads/2021/05/SampleRubrics.pdf>

