

# Statewide Environmental Justice Analysis Methodology 2023-2026 Pennsylvania Transportation Improvement Program

*Prepared by*

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## Step 1

### Data collection

This analysis was conducted completely on “fresh” data acquired from the below identified sources in April 2021.

| Topic   | Data Set   | Table   |
|---|--|---|
| <a href="#">Census Block Group Boundaries</a> | US Census Bureau, 2019 State Level Geodatabase for Pennsylvania                        |   |
| <a href="#">Census County Boundaries</a>      | US Census Bureau, 2019 State Level Geodatabase for Pennsylvania                        |   |
| Race  | <a href="#">US Census Bureau, 2015-2019 American Community Survey 5-Year Estimates</a> | <a href="#">B03002 Hispanic or Latino Origin by Race</a>  |
| Minority                                      | <a href="#">US Census Bureau, 2015-2019 American Community Survey 5-Year Estimates</a> | <a href="#">B03002 Hispanic or Latino Origin by Race</a>  |
| Low-Income Households                         | <a href="#">US Census Bureau, 2015-2019 American Community Survey 5-Year Estimates</a> | <a href="#">B17017 Poverty Status in the Past 12 Months by Household Type by Age of Householder</a>   |
| Low-Income Population                         | <a href="#">US Census Bureau, 2015-2019 American Community Survey 5-Year Estimates</a> | <a href="#">S1701 Poverty Status in the Past 12 Months</a>  |
| Minority Populations by Low-Income Status     | <a href="#">US Census Bureau, 2015-2019 American Community Survey 5-Year Estimates</a> | <a href="#">S1701 Poverty Status in the Past 12 Months</a>  |
| Limited English Proficiency (LEP)             | <a href="#">US Census Bureau, 2015-2019 American Community Survey 5-Year Estimates</a> | <a href="#">DP02 Selected Social Characteristics in the United States</a>   |
| Persons with a Disability                     | <a href="#">US Census Bureau, 2015-2019 American Community Survey 5-Year Estimates</a> | <a href="#">DP02 Selected Social Characteristics in the United States</a>   |
| Elderly (65 years or older)                   | <a href="#">US Census Bureau, 2015-2019 American Community Survey 5-Year Estimates</a> | <a href="#">DP05 ACS Demographic and Housing Estimates</a>  |
| Carless Households                            | <a href="#">US Census Bureau, 2015-2019 American Community Survey 5-Year Estimates</a> | <a href="#">DP04 Selected Housing Characteristics</a>   |
| Computerless Households                       | <a href="#">US Census Bureau, 2015-2019 American Community Survey 5-Year Estimates</a> | <a href="#">DP04 Selected Housing Characteristics</a>   |
| Internetless Households                       | <a href="#">US Census Bureau, 2015-2019 American Community Survey 5-Year Estimates</a> | <a href="#">DP04 Selected Housing Characteristics</a>   |
| Crashes                                       | <a href="#">PennDOT Crash Data</a>   | Statewide Crash Data for <a href="#">2015</a> , <a href="#">2016</a> , <a href="#">2017</a> , <a href="#">2018</a> , and <a href="#">2019</a> |
| Federal Aid Segment Miles                     | <a href="#">PennDOT RMS</a>  | FED_AID_PRIM_IND field = Y  |
| Bridges                                       | <a href="#">PennDOT BMS 2</a>  |   |

All US Census Bureau, 2015–2019 American Community Survey datasets were acquired for all Pennsylvania Counties and for all Pennsylvania Census Block Groups. Relevant columns from the Census tables were extracted into a two new tables to produce flat table profiles. These tables were then joined to the relevant Census geography features.

## Step 2

### Identifying EJ Populations

#### General Approach

Minority and low income populations was conducted substantially according to the methodology outlines in the South Central Pennsylvania Unified Environmental Justice Process and Methodology document distributed to Planning Partners ahead of the 2021-2024 TIP update cycle. As such, I will refer the reader to Appendix A and Appendix B of the South Central Pennsylvania Unified Environmental Justice Process and Methodology for detailed step-by-step recipes of how to bake the data ingredients into an analysis cake. However, my process differed in one crucial but important aspect that is necessary to allow a statewide uniform analysis.

The process followed for the 2021-2024 program update classified low income and minority population percentages based on natural breaks of the percentages of those populations present within the block groups of each county in Pennsylvania. The result of this was to create a custom classification of symbol intervals for each county. The presence of 67 different interval scales would lead to conducting 67 separate analyses downstream in the workflow.

Instead, I found that when Census block groups were classified into intervals based on the *ratio* of census block group minority/low income percentage to county or region overall minority/low income percentage (i.e. a ratio of “1” indicates a census block group has the same minority or low income percentage as the county average) that I was able to produce a uniform scale usable across all counties or regions in the state. One side effect of this approach is that it resulted in some counties not having all intervals. However, it gives us a uniform and easily communicated and understood way of classifying the relative concentrations of low income and minority populations across the state of Pennsylvania.

As an example, based on the procedure described above, I defined interval “1” as being all census block groups with a minority population percentage less than half the countywide or regional minority population percentage. The result is that any counties or regions with no census block groups that fit that criterion do not have that interval. By standardizing the intervals across the state we are able to make apples-to-apples comparisons between counties and regions and also the ability to scale the analysis up to larger geographic scales (or down to smaller scales) which gives us a stronger analytical product. This should make this product more useful for conducting analysis for multicounty planning partners and across PennDOT districts if we wanted to scale the analysis up to be more regional.

## Definition of Minority Population and Low income Population Concentration Intervals

| Minority Intervals | Ratio of Minority Population Percentage in Census Block Group to County or Planning Partner Minority Population Percentage  |
|--------------------|---|
| 1                  | Census Block Minority Population Percentage / County or Planning Partner Minority Population Percentage $\leq 0.5$ (Census block group minority population percentage less than or equal to half of countywide or regional minority population percentage)  |
| 2                  | Census Block Minority Population Percentage / County or Planning Partner Minority Population Percentage $> 0.5$ and $\leq 1$ (Census block group minority population percentage greater than half and less than or equal to countywide or regional minority population percentage)  |
| 3                  | Census Block Minority Population Percentage / County or Planning Partner Minority Population Percentage $> 1$ and $\leq 2$ (Census block group minority population percentage greater than County Minority Population Percentage and less than or equal to twice the countywide or regional minority population percentage) |
| 4                  | Census Block Minority Population Percentage / County or Planning Partner Minority Population Percentage $> 2$ and $\leq 4$ (Census block group minority population percentage greater than twice and less than or equal to four times the countywide or regional minority population percentage)                            |
| 5                  | Census Block Minority Population Percentage / County or Planning Partner Minority Population Percentage $> 4$ (Census block group minority population percentage greater than four times the countywide minority population percentage)   |

| Low Income Intervals | Ratio of Low Income Population Percentage in Census Block Group to County or Planning Partner Low Income Population Percentage  |
|----------------------|---|
| 1                    | Census Block Low Income Population Percentage / County Low Income Population Percentage $\leq 0.5$ (Census block group Low Income population percentage less than or equal to half of countywide or regional Low Income population percentage)  |
| 2                    | Census Block Low Income Population Percentage / County Low Income Population Percentage $> 0.5$ and $\leq 1$ (Census block group Low Income population percentage greater than half and less than or equal to countywide or regional Low Income population percentage)  |
| 3                    | Census Block Low Income Population Percentage / County Low Income Population Percentage $> 1$ and $\leq 2$ (Census block group Low Income population percentage greater than County Low Income Population Percentage and less than or equal to twice the countywide or regional Low Income population percentage) |
| 4                    | Census Block Low Income Population Percentage / County or Planning Partner Low Income Population Percentage $> 2$ and $\leq 4$ (Census block group Low Income population percentage greater than twice and less than or equal to four times the countywide or regional Low Income population percentage)          |
| 5                    | Census Block Minority Population Percentage / County Minority Population Percentage $> 4$ (Census block group minority population percentage greater than four times the countywide minority population percentage)   |

## Step 3

### Assessing Conditions

Assessment of conditions analysis was only conducted for components of the transportation system for which statewide datasets are available (namely pavement conditions of the Federal Aid System, bridges, and reportable crashes). All of these data are freely available from the PennDOT Open Data Portal (<https://data-pennshare.opendata.arcgis.com/>). Additional data that should be considered by planning partners would be walkway networks, transit stops, and bicycle infrastructure. If statewide datasets become available for these components of the state transportation system, they could be easily incorporated into future iterations of the analysis.

To perform the assessment of conditions analysis, two important steps were conducted:

1. A map layer was created from dissolving together block groups of the same interval classification within each county and region for low income and minority concentration. These “interval areas” describe the contiguous areas within a county that fall within the same classification.
2. Transportation assets and crash locations were considered in the analysis of an interval area if located within 50 meters of the boundary of the dissolved interval area. In other words, the dissolved interval areas were buffered 50 meters for the analysis. This would allow the capture of features on the border of block groups or providing access to them.

All analysis was conducted within ArcGIS Pro and any attempt to verify or replicate this analysis would most appropriately begin on that platform. As such, instead of trying to produce a written procedure of the analytical steps the next page shows the ArcGIS Pro model used to daisy-chain together the various geospatial processing tools that processed the data. In a general sense, the following aspects of the transportation system were summarized by county and low income and minority concentration interval:

- Federal aid segment miles with “excellent,” “good,” “fair,” “poor,” or “other” pavement condition
- Number and bridge deck area of poor/not poor bridges
- Reportable crashes occurring 2015–2019. The 5-year totals are provided in the data extract and can be divided by 5 to get the average annual amounts. Crashes of the following types were analyzed:
  - Total Crashes
  - Total Persons Involved in Crashes
  - All Bicycle Crashes
  - Bicycle Crash Fatalities

- Bicycle Crash Suspected Serious Injuries
- All Pedestrian Crashes
- Pedestrian Crash Fatalities
- Pedestrian Crash Suspected Serious Injuries
- All Nonmotorized Crashes
- Nonmotorized Fatalities
- Nonmotorized Suspected Serious Injuries
- All Horse and Buggy Crashes
- Total Crash Fatalities
- Total Crash Suspected Serious Injuries



