Methodology for Calculating Opportunity Youth (16-24) at the County Level

Data Inputs

- 2015-2019 American Community Survey microdata from IPUMS-USA for North Carolina Public Use Microdata Areas (PUMAs)
  Note: the 5-Year American Community Survey is necessary to ensure sufficient sample size in all areas across the state
- County-level population estimates by single-year of age and race and ethnicity from CDC Surveillance, Epidemiology, and End Results Program
- PUMA to county geographic correspondence file from Missouri Census Data Center (Geocorr 2018)

Identifying "Opportunity Youth"

Opportunity youth are individuals ages 16-24 who are neither in school or working (full or part time). This figure includes incarcerated youth who are not enrolled in school and unemployed individuals who are not enrolled in school.

PUMAs and Counties

Public Use Microdata Areas or PUMAs are statistical geographies from the U.S. Census Bureau that represent the smallest geography for which the Bureau provides individual-level microdata records for the American Community Survey. The microdata is necessary to calculate the total number and proportion of opportunity youth because these data are not otherwise reported by the Census Bureau. (The table currently available about youth employment and schooling is limited to ages 16-19.)

PUMAs correspond to areas with roughly a population of 100,000 or more in 2010 and conform to county boundaries as much as possible. Less populated counties are combined into one PUMA; for example, there are two PUMAs in the Northeast that each contain six counties:

- **Northeast Albemarle Sound Region** (PUMA 700): Camden, Chowan, Currituck, Gates, Pasquotank, and Perquimans
- **South & West Albemarle Sound & Northern Outer Banks Regions** (PUMA 800): Bertie, Dare, Hyde, Martin, Tyrrell, and Washington

More populous counties often have one or more PUMAs, allowing for sub-county estimation. North Carolina's largest counties—Mecklenburg and Wake—each have 8 PUMAs within their borders.

Estimating Opportunity Youth

To calculate the percentage of opportunity youth, we first calculate the total number of opportunity youth and the total number of youth ages 16-24 overall for each PUMA. We then

divide the number of opportunity youth by the total population ages 16-24. The specific approach to calculating these populations varies depending on the county relationship to PUMAs.

Direct Estimation

There are 20 counties that do not share PUMAs with other counties and can be directly estimated without adjustment. These are:

- Alamance
- Brunswick
- Buncombe
- Catawba
- Craven
- Cumberland
- Davidson
- Durham
- Forsyth
- Gaston
- Guilford
- Harnett
- Johnston
- Mecklenburg
- Orange
- Pitt
- Randolph
- Rowan
- Wake
- Wayne

Population-adjusted estimation

For counties that cannot be directly estimated, we estimate the opportunity youth population based on the county population ages 16-24 by race and ethnicity during 2015-2019 and the race-specific rates of youth disconnection for the county's parent PUMA. This involved the following steps:

1) Use 5-year ACS data to calculate opportunity youth rates by race/ethnicity and PUMA. We used a collapsed set of racial/ethnic groups to ensure sufficient underlying sample size and alignment with population data from CDC SEER. Rates were calculated for the following groups:
    a. Black, Non-Hispanic
    b. Hispanic/Latinx
    c. White, Non-Hispanic
    d. All Other Races, Non-Hispanic (includes American Indian, Asian/Pacific Islander, and Multiracial)

2) Use CDC SEER population data to calculate the number of individuals ages 16-24-years-old in the four racial classifications in each county. Calculate the average number of individuals by race/ethnicity for the five-year period between 2015 and 2019.
3) Estimate the county-level opportunity youth rate using the corresponding rate at the PUMA level:
   a. Use the PUMA-to-County relationship file from the Missouri Census Data Center to identify which counties are partially within a PUMA and which PUMAs are entirely within counties.
   b. Calculate the county-specific opportunity youth population by the following:
      i. $Opp\_Youth_{ij} = Pop_{ij} \times p\_opp\_youth_{ip}$
         Where the number of opportunity youth of racial/ethnic group i in county j is equal to the total population of racial/ethnic group i in county j multiplied by the race/ethnicity-specific opportunity youth rate for the county's parent PUMA p.

         Note: for the six counties that had one PUMA wholly within the county and one PUMA shared with another county, the population in the shared PUMA was further weighted by the proportion of the county's population captured in the PUMA (**afact_cty**, as identified in Step 3a using the MCDC geographic relationship file).

      ii. $Opp\_Youth_j = Opp\_Youth_{Black\,j} + Opp\_Youth_{Hisp\,j} + Opp\_Youth_{White\,j} + Opp\_Youth_{Other\,j}$
         The total opportunity youth in county j is equal to the sum of opportunity youth estimated for each of the four racial/ethnic groups.

         The total population in county j is equal to the sum of the population estimates for each of the four racial/ethnic groups. For the six counties with one PUMA wholly within the county and one PUMA shared with another county, the total population in the shared PUMA was weighted by the proportion of the county's population captured in the PUMA.

County/PUMA Relationships

Counties with multiple PUMAs (8 counties)

Counties listed alphabetically with number of PUMAs within county noted in parentheses

- Buncombe (2)
- Cumberland (3)
- Durham (2)
- Forsyth (3)
- Gaston (2)
- Guilford (4)
- Mecklenburg (8)
- Wake (8)

Counties with one PUMA (12 counties)

- Alamance
- Brunswick
- Catawba
- Craven
- Davidson
- Harnett
- Johnston
- Orange
- Pitt
- Randolph
- Rowan
- Wayne

Counties with one PUMA entirely within county and one shared PUMA (6 counties)

Counties and component PUMAs listed below

- Cabarrus
    - Cabarrus (West)
    - Cabarrus (East) with Stanly
- Iredell
    - Iredell (South)
    - Iredell (North) with Davie and Yadkin
- New Hanover
    - New Hanover (South)
    - New Hanover (North) with Pender
- Onslow
    - Onslow (South)
    - Onslow (North) with Jones and Lenoir
- Robeson

- o Robeson (West)
  - o Robeson (East) with Bladen and Columbus
- Union
  - o Union (West)
  - o Union (East) with Anson

Counties that share a PUMA with one other county (22 counties)

County	Shared with
Alexander	Caldwell
Anson	Union (East)
Burke	McDowell
Caldwell	Alexander
Chatham	Lee
Duplin	Sampson
Edgecombe	Nash
Greene	Wilson
Henderson	Transylvania
Lee	Chatham
Lincoln	Cleveland (East)
McDowell	Burke
Montgomery	Moore
Moore	Montgomery
Nash	Edgecombe
Pender	New Hanover (North)
Rockingham	Stokes
Sampson	Duplin
Stanly	Cabarrus (East)
Stokes	Rockingham
Transylvania	Henderson
Wilson	Greene

Counties that share a PUMA with two other counties (22 counties)

County	Shared with
Alleghany	Surry, Wilkes
Beaufort	Carteret, Pamlico
Bladen	Columbus, Robeson (East)
Carteret	Beaufort, Pamlico
Caswell	Granville, Person
Columbus	Bladen, Robeson (East)
Davie	Iredell (North), Yadkin
Franklin	Vance, Warren (West)
Granville	Caswell, Person
Hoke	Richmond, Scotland

Jones	Lenoir, Onslow (North)
Lenoir	Jones, Onslow (North)
Pamlico	Carteret, Beaufort
Person	Caswell, Granville
Polk	Cleveland (West), Rutherford
Richmond	Hoke, Scotland
Rutherford	Cleveland (West), Polk
Scotland	Hoke, Richmond
Surry	Alleghany, Wilkes
Vance	Franklin, Warren (West)
Wilkes	Alleghany, Surry
Yadkin	Davie, Iredell (North)

Counties that share a PUMA with three other counties (7 counties)

County	Shared with
Cherokee	Clay, Jackson (South), Macon
Clay	Cherokee, Jackson (South), Macon
Cleveland	Polk, Rutherford (PUMA 2600) Lincoln (PUMA 2700)
Halifax	Hertford, Northampton, Warren (East)
Hertford	Halifax, Northampton, Warren (East)
Macon	Cherokee, Clay, Jackson (South)
Northampton	Halifax, Hertford, Warren (East)

Counties that share a PUMA with four other counties (9 counties)

County	Shared with
Ashe	Avery, Mitchell, Watauga, Yancey
Avery	Ashe, Mitchell, Watauga, Yancey
Graham	Haywood, Jackson (North), Madison, Swain
Haywood	Graham, Jackson (North), Madison, Swain
Madison	Graham, Haywood, Jackson (North), Swain
Mitchell	Ashe, Avery, Watauga, Yancey
Swain	Graham, Haywood, Jackson (North), Madison
Watauga	Ashe, Avery, Mitchell, Yancey
Yancey	Ashe, Avery, Mitchell, Watauga

Counties that share a PUMA with five other counties (13 counties)

County	Shared with
Bertie	Dare, Hyde, Martin, Tyrrell, Washington
Camden	Chowan, Currituck, Gates, Pasquotank, Perquimans

Chowan	Camden, Currituck, Gates, Pasquotank, Perquimans
Currituck	Camden, Chowan, Gates, Pasquotank, Perquimans
Dare	Bertie, Hyde, Martin, Tyrrell, Washington
Gates	Camden, Chowan, Currituck, Pasquotank, Perquimans
Hyde	Bertie, Dare, Martin, Tyrrell, Washington
Martin	Bertie, Dare, Hyde, Tyrrell, Washington
Pasquotank	Camden, Chowan, Currituck, Gates, Perquimans
Perquimans	Camden, Chowan, Currituck, Gates, Pasquotank
Tyrrell	Bertie, Dare, Hyde, Martin, Washington
Warren	Franklin, Vance (PUMA 500) Halifax, Hertford, Northampton (PUMA 600)
Washington	Bertie, Dare, Hyde, Martin, Tyrrell

Counties that share a PUMA with seven other counties (1 county)

County	Shared with
Jackson	Graham, Haywood, Madison, Swain (PUMA 2300) Cherokee, Clay, Macon (PUMA 2400)

Full List of Counties to PUMAs

Note: "-" indicates the county is completely covered by a PUMA or set of PUMAs

County	Shared with
Alamance	-
Alexander	Caldwell
Alleghany	Surry, Wilkes
Anson	Union (East)
Ashe	Avery, Mitchell, Watauga, Yancey
Avery	Ashe, Mitchell, Watauga, Yancey
Beaufort	Carteret, Pamlico
Bertie	Dare, Hyde, Martin, Tyrrell, Washington
Bladen	Columbus, Robeson (East)
Brunswick	-
Buncombe	-
Burke	McDowell
Cabarrus	Stanly
Caldwell	Alexander
Camden	Chowan, Currituck, Gates, Pasquotank, Perquimans
Carteret	Beaufort, Pamlico
Caswell	Granville, Person
Catawba	-
Chatham	Lee
Cherokee	Clay, Jackson (South), Macon
Chowan	Camden, Currituck, Gates, Pasquotank, Perquimans
Clay	Cherokee, Jackson (South), Macon
Cleveland	Polk, Rutherford (PUMA 2600) Lincoln (PUMA 2700)
Columbus	Bladen, Robeson (East)
Craven	-
Cumberland	-
Currituck	Camden, Chowan, Gates, Pasquotank, Perquimans
Dare	Bertie, Hyde, Martin, Tyrrell, Washington
Davidson	-
Davie	Iredell (North), Yadkin
Duplin	Sampson
Durham	-
Edgecombe	Nash
Forsyth	-
Franklin	Vance, Warren (West)
Gaston	-

Gates	Camden, Chowan, Currituck, Pasquotank, Perquimans
Graham	Haywood, Jackson (North), Madison, Swain
Granville	Caswell, Person
Greene	Wilson
Guilford	-
Halifax	Hertford, Northampton, Warren (East)
Harnett	-
Haywood	Graham, Jackson (North), Madison, Swain
Henderson	Transylvania
Hertford	Halifax, Northampton, Warren (East)
Hoke	Richmond, Scotland
Hyde	Bertie, Dare, Martin, Tyrrell, Washington
Iredell	Davie, Yadkin
Jackson	Graham, Haywood, Madison, Swain (PUMA 2300) Cherokee, Clay, Macon (PUMA 2400)
Johnston	-
Jones	Lenoir, Onslow (North)
Lee	Chatham
Lenoir	Jones, Onslow (North)
Lincoln	Cleveland (East)
Macon	Cherokee, Clay, Jackson (South)
Madison	Graham, Haywood, Jackson (North), Swain
Martin	Bertie, Dare, Hyde, Tyrrell, Washington
McDowell	Burke
Mecklenburg	-
Mitchell	Ashe, Avery, Watauga, Yancey
Montgomery	Moore
Moore	Montgomery
Nash	Edgecombe
New Hanover	Pender
Northampton	Halifax, Hertford, Warren (East)
Onslow	Jones, Lenoir
Orange	-
Pamlico	Carteret, Beaufort
Pasquotank	Camden, Chowan, Currituck, Gates, Perquimans
Pender	New Hanover (North)
Perquimans	Camden, Chowan, Currituck, Gates, Pasquotank
Person	Caswell, Granville
Pitt	-
Polk	Cleveland (West), Rutherford
Randolph	-
Richmond	Hoke, Scotland

Robeson	Bladen, Columbus
Rockingham	Stokes
Rowan	-
Rutherford	Cleveland (West), Polk
Sampson	Duplin
Scotland	Hoke, Richmond
Stanly	Cabarrus (East)
Stokes	Rockingham
Surry	Alleghany, Wilkes
Swain	Graham, Haywood, Jackson (North), Madison
Transylvania	Henderson
Tyrrell	Bertie, Dare, Hyde, Martin, Washington
Union	Anson
Vance	Franklin, Warren (West)
Wake	-
Warren	Franklin, Vance (PUMA 500) Halifax, Hertford, Northampton (PUMA 600)
Washington	Bertie, Dare, Hyde, Martin, Tyrrell
Watauga	Ashe, Avery, Mitchell, Yancey
Wayne	-
Wilkes	Alleghany, Surry
Wilson	Greene
Yadkin	Davie, Iredell (North)
Yancey	Ashe, Avery, Mitchell, Watauga