# Analysis of Demographic Factors for Populations Living Near Hazardous Waste Combustor NESHAP Facilities

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## Disclaimer

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# **1. Introduction**

This document provides summary results and describes the approach used to evaluate the different socio-economic demographic groups within the population living near Hazardous Waste Combustors in the United States (U.S.). The U.S. Environmental Protection Agency (EPA) is proposing to amend the National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulating Hazardous Waste Combustors (HWC). These amendments would remove the exemptions and revise other provisions associated with emission standard exemptions for periods of malfunction, add electronic reporting provisions, amend emergency safety vent provisions, and correct other minor provisions. This demographic analysis is for 96 HWC facilities identified by the EPA as subject to the rules and guidelines contained in 40 CFR Part 63, Subpart EEE.

The current analysis evaluates census blocks surrounding these facilities with censusbased demographic data. This analysis presents the demographic composition of the population located within close proximity at 5 kilometers (km) and within 50 km of these HWC facilities. The following demographic groups were included in this proximity analysis:

- Total population;
- White;
- People of Color;
- African American (or Black);
- Native Americans;
- Other races and multiracial;
- Hispanic or Latino;
- Children 17 years of age and under;
- Adults 18 to 64 years of age;
- Adults 65 years of age and over;
- People living below the poverty level;
- People living below twice the poverty level;
- Adults 25 years of age and older without a high school diploma; and
- Linguistically isolated people.

The current analysis used the Proximity Tool<sup>1</sup> to (1) identify all census blocks with centroids<sup>2</sup> located within specified radii of the latitude/longitude location of each facility, and then (2) link each block with census-based demographic data. It should be noted that, if the centroid of a census block is located within the specified radius, the entire population of that census block is counted as within the radius. In addition to facility-specific demographics, the Proximity Tool also computes the demographic composition of the populations within the specified radii for all facilities grouped as a whole (e.g., source category-wide). The source category-wide computation accounts for neighboring facilities with overlapping study areas and ensures populations in common are counted only once in this demographic analysis. Finally, this

<sup>1.</sup> Developed by SC&A in 2021 under contract to the U.S. Environmental Protection Agency; updated by SC&A in 2022 to incorporate 2020 Census data.

<sup>2.</sup> A census block centroid is considered a central location of the block polygon it represents and contains the same census-based information as the block polygon (e.g., the same population). Also refer to <a href="https://www2.census.gov/geo/pdfs/reference/GARM/glosGARM.pdf">https://www2.census.gov/geo/pdfs/reference/GARM/glosGARM.pdf</a>

analysis compares these source category-wide demographics at each specified radius (i.e., 5 km, 50 km) to the demographic composition of the nationwide population.

The census data used in this analysis is described in Section 2. The algorithms used to compute the population of each demographic category surrounding the facility are presented in Section 3. The summary results of this analysis are presented in Section 4. The Appendix points to a supplemental workbook of spreadsheets containing the detailed facility-specific results.

## 2. Census Data

The total population within a specified radius around each facility is the sum of the population for every census block within that radius, based on each block's population provided by the 2020 Decennial Census.<sup>3</sup> For the demographic analysis, statistics on total population, race, ethnicity, age, low-income (poverty) level, education level, and linguistic isolation are obtained from the Census' American Community Survey (ACS) five-year averages for 2016-2020.<sup>4</sup> These data are provided at the block group level. A census block group contains about 24 blocks on average, with an average of 1,400 people. **Table 1** summarizes the census data used in the analysis, showing the source of each dataset and the level of geographic resolution.

The statistics for race/ethnicity categories, age groups, poverty status, educational attainment, and linguistic isolation are consistent with the demographic statistics used in EPA's EJSCREEN tool for Environmental Justice analysis.<sup>5</sup> We derive our demographic statistics from the ACS, which is the source of data for these statistics in EJSCREEN. For the current analysis, however, we provide the impact on different racial and ethnic groups in more detail, as Table 1 illustrates.

U.S. Census Bureau, 2022. USA Census 2020 Redistricting Blocks. ArcGIS feature layer from Esri containing block level 2020 Decennial Census data as reported by the U.S. Census Bureau with attributes from the 2020 Public Law 94-171 (P.L. 94-171) tables. Available at <a href="https://www.arcgis.com/home/item.html?id=b3642e91b49548f5af772394b0537681">https://www.arcgis.com/home/item.html?id=b3642e91b49548f5af772394b0537681</a>. January 25, 2022. Also refer to <a href="https://www.census.gov/programs-surveys/decennial-census/about/rdo/summary-files.html#P2">https://www.census.gov/programs-surveys/decennial-census/about/rdo/summary-files.html#P2</a>.

<sup>4.</sup> U.S. Census Bureau, 2022. 2020 American Community Survey. 2016-2020 ACS 5-year Estimates: Tract and Block Group Files by State: <u>https://www2.census.gov/programs-</u> <u>surveys/acs/summary\_file/2020/data/5\_year\_entire\_sf/Tracts\_Block\_Groups\_Only.zip</u>. March 17, 2022. Also refer to <u>https://www.census.gov/programs-surveys/acs/about.html</u>.

<sup>5.</sup> U.S. Environmental Protection Agency. 2024. EJSCREEN: EPA's Environmental Justice Screening and Mapping Tool (Version 2.2). <u>https://www.epa.gov/ejscreen</u>

Type of population category	Source of data	Level of geographic resolution	
Total population (sum of block centroid counts)	2020 Census, P.L. 94-171 Tables <sup>(a)</sup>	Census block	
Total population (sum of block group counts, used for demographic percentages)	2016-2020 ACS <sup>(b)</sup> Table B03002 (e1)	Census block group	
Race/ethnicity categories (percentages):	ACS Table B03002, Hispanic or Latino Origin by Race (Tiger table X03):	Census block group	
	<ul> <li>White (non-hispanic): e3/e1</li> <li>People of Color (non-white + hispanic): (e1-e3)/e1</li> <li>African American (non-hispanic): e4/e1</li> <li>Native American (non-hispanic): e5/e1</li> <li>Other &amp; Mixed Race (non-hispanic): (e6+e7+e8+e9)/e1</li> <li>Hispanic (all races): e12/e1</li> </ul>		
Age groups	ACS Table B01001, Sex by Age (Tiger table X01)	Census block group	
Individuals living in households earning below the poverty level (percentage of individuals)	ACS Table C17002, Ratio of Income to Poverty Level (Tiger table X17): (e2+e3)/e1	Census block group	
Individuals living in households earning below twice the poverty level (percentage of individuals)	ACS Table C17002, Ratio of Income to Poverty Level (Tiger table X17): (e1-e8)/e1	Census block group	
Level of education – percentage of adults 25 years and older without a high school diploma	ACS Table B15002, Sex by Educational Attainment (Tiger table X15)	Census block group	
Individuals living in linguistically isolated households (percentage of households)	ACS Table C16002, Household Language by Household (Tiger table X16): (e4+e7+e10+e13)/e1	Census block group	

#### Table 1. Summary of Census Data Used for Different Demographic Groups

(a) U.S. Census Bureau, 2022. USA Census 2020 Redistricting Blocks. ArcGIS feature layer from Esri containing block level 2020 Decennial Census data as reported by the U.S. Census Bureau with attributes from the 2020 Public Law 94-171 (P.L. 94-171) tables. Available at <u>https://www.arcgis.com/home/item.html?id=b3642e91b49548f5af772394b0537681</u>. January 25, 2022. Also refer to <u>https://www.census.gov/programs-surveys/decennial-census/about/rdo/summary-files.html#P2</u>.

<sup>(</sup>b) U.S. Census Bureau, 2022. 2020 American Community Survey. 2016-2020 ACS 5-year Estimates: Tract and Block Group Files by State:

https://www2.census.gov/programs-surveys/acs/summary\_file/2020/data/5\_year\_entire\_sf/Tracts\_Block\_Groups\_Only.zip. April 5, 2022. Also refer to https://www.census.gov/programs-surveys/acs/about.html.

## **3.** Calculation Methods

The Proximity Tool uses the census block and census block group identification codes to link each block to the appropriate ACS block group demographic statistics. This allows us to estimate the number of people in different demographic categories for each census block in a specified radius around each facility. As noted in Section 2, demographic data is available at the census block group level. To estimate more detailed block level demographic percentages for the purposes of this analysis, the demographic characteristics of a given block group – that is, the percentage of people in different races/ethnicities, the percentage in different age groups, the percentages with low-incomes (that are below the poverty level and below twice the poverty level), the percentage of adults without a high school diploma, and the percentage that are linguistically isolated – are presumed to also describe each census block located within that block group.

For comparison, the nationwide demographic percentages are computed from the Census' ACS five-year averages for 2016-2020 ("2020 ACS"). The denominator for these percentages uses the total nationwide population, which is likewise computed from the 2020 ACS and determined by summing the total population of all census block groups. We also provide the total population based on the 2020 Decennial Census at block level for comparison, because the census block populations are based on 2020 Decennial Census data, as noted in Section 2.

Sections 3.1 through 3.4 describe calculation methods for racial, ethnic, age, low-income (poverty) status, education status, and linguistic isolation demographic categories. Section 3.5 describes the gap-filling approach used when block group statistics are not available for a given block, based on computing default averages for the missing demographic(s) at the tract level or nearest neighboring block group.

#### 3.1 Race, Ethnicity and Age Categories

Table B03002 (Hispanic or Latino origin by race) of the ACS data provides race/ethnicity statistics for each census block group nationwide. Table B01001 provides age statistics for the population by ranges (in years) for each census block group nationwide. For each census block in this analysis, the race/ethnicity (White, African American, Native American, Multiracial/Other, and Hispanic or Latino) and age range (0-17, 18-64 and  $\geq$ 65 years) for that block is estimated based on the demographic information provided at the block group level, as follows:

$$N(s,b/bg) = N(t,b/bg) \times P(s,bg)/100$$

where:

N(s,b/bg)	is the number of people in racial/ethnic or age subgroup "s", in census block "b"
	of block group "bg"
N(t,b/bg)	is the total number of people in census block "b" of block group "bg"
P(s,bg)	is the percentage of people in racial/ethnic or age subgroup "s", in a block group
	"bg"

The number of people in each racial/ethnic and age category is calculated using the above equation, summed over all blocks that fall within the specified radius of each facility.

#### 3.2 Low-Income Level

Table C17002 (poverty) of the ACS estimates the numbers of individuals within a Census block group who live in households where the household income is below the poverty line, and below various multiples of the poverty line. For this analysis, we calculate two low-income statistics based on the fractions of (1) individuals living in households earning incomes below the poverty level, and (2) individuals living in households earning incomes below two times the poverty level, respectively. For each census block in this analysis, the block's household income level is estimated based on the demographic information provided at the block group level, as follows:

 $N(hi,b/bg) = N(t,b/bg) \times P(hi,bg)/100$ 

where "hi" indicates household income, whether below the poverty level or below two times the poverty level, depending on the income statistic relative to the poverty level, and:

N(hi,b/bg)	is the number of people living in low-income households "hi" relative to the
	poverty level, in census block "b" of block group "bg"
N(t,b/bg)	is the total number of people in block "b" of block group "bg"
P(hi,bg)	is the percentage of people living in households "hi" relative to the poverty
	level, among the population for which poverty status is known, in block group
	"bg"

The numbers of people living in households earning (1) below the poverty level and (2) below two times the poverty level are calculated using the above equation, summed over all blocks that fall within the specified radius of each facility.

#### 3.3 Level of Education

Table B15002 (educational attainment) of the ACS provides education attainment statistics for each census block group nationwide. For each census block in this analysis, the number of people 25-years and older without a high school diploma is estimated based on the demographic information provided at the block group level, as follows:

 $N(nhs,b/bg) = N(t,b/bg) \times P(nhs,bg) / 100$ 

where:

N(nhs,b/bg)	is the number of people 25-years and older without a high school diploma
	"nhs", in census block "b" of block group "bg"
N(t,b/bg)	is the total number of people 25-years and older in block "b" of block group
	"bg"
P(nhs,bg)	is the percentage of people 25-years and older without a high school diploma
	"nhs", in a block group "bg"

The number of people 25-years and older without a high school diploma is calculated using the above equation, summed over all blocks that fall within the specified radius of each facility.

#### 3.4 Linguistic Isolation

Linguistic Isolation is defined by in the ACS as "a household in which all members age 14 years and over speak a non-English language and also speak English less than "very well" (have difficulty with English)."<sup>6</sup> Table C16002 (Tiger table X16\_language\_spoken\_at\_home) of the ACS provides the number of households in linguistic isolation in each block group. For each census block in this analysis, the number of people living in linguistic isolation is estimated based on the demographic information provided at the block group level, as follows:

$$N(li,b/bg) = N(t,b/bg) \times P(li,bg)/100$$

where:

N(li,b/bg)	is the number of people living in linguistic isolation "li", in census block "b" of
	block group "bg"
N(t,b/bg)	is the total number of people in census block "b" of block group "bg"
P(li,bg)	is the percentage of linguistically isolated households "li", in block group "bg"

The number of people living in linguistic isolation is calculated using the above equation, summed over all blocks that fall within the specified radius of each facility.

#### 3.5 Defaults

Block and block group designations used in the Census may be modified to accommodate population growth in some regions. As a result, certain blocks which are based on the last Decennial Census, may not map to the block group designations used in the latest five-year ACS survey. In addition, some statistics may not be reported in the ACS for every block group. Race, ethnicity, and age statistics are generally reported for all block groups. However, low-income, educational attainment, and linguistic isolation statistics are not available for some block groups.

In these cases, we compute default estimates for the missing demographic statistics based on the average statistics for the tract in which the block is located. If no tract-level data are available, demographic statistics are estimated based on the statistics of the nearest (non-zero population) block group neighbor to the unmatched block location. This gap-filling exercise is performed separately for each type of demographic data. That is, in the case where some categories of data are available (for instance, race, age and ethnicity) and others are not available (low-income, educational attainment, or linguistic isolation) we only compute defaults for the categories of data that are missing.

U.S. Census Bureau, 2020. American Community Survey and Puerto Rican Community Survey 2019 Subject Definitions. P. 49. <u>https://www2.census.gov/programs-</u> <u>surveys/acs/tech\_docs/subject\_definitions/2019\_ACSSubjectDefinitions.pdf</u>

The tract level defaults are computed using weighted averages based on all of the other block groups in the tract for which data are available. Defaults are calculated as follows for race, ethnicity, and age subgroups:

$$P(s,T) = \left\{ \sum P(s,bg/T) \times N(t,bg) \right\} / \left\{ \sum N(t,bg) \right\}$$

where:

P(s,T)	is the percentage of people in race, ethnicity, or age subgroup "s", in census
	tract "T"
Σ	refers to the summation over all census block groups in tract "T" for which data are available
P(s,bg/T)	is the percentage of people in race, ethnicity, or age subgroup "s", in a census block group "bg" of tract "T"
N(t,bg)	is the total number of people in block group "bg"

Defaults for low-income, educational attainment, and linguistic isolation are calculated in a similar fashion, except that the population weighting term N is replaced by the population for which low-income status is known, the population over age 25, and the number of households, respectively.

#### 4. Results

The proximity results describe the demographics of the population surrounding the Hazardous Waste Combustors (HWC) facilities. **Table 2** presents the demographic composition of the population located within a close proximity of 5 km and within 50 km of the 96 facilities as a whole (source category wide). For context, Table 2 also provides the nationwide percentages of these various demographic groups. The detailed facility-specific results underpinning these source category-wide results are noted in the Appendix.

Based on the 2020 Census, there are approximately 1,772,400 people residing within 5 km of the 96 HWC facilities. The proximity results presented in Table 2 indicate that the population percentages for certain demographic groups within 5 km of these 96 facilities are greater than the corresponding nationwide percentages. The demographic percentage for populations residing within 5 km of facility operations is 9 percentage points greater than its corresponding nationwide percentage for people living below twice the poverty level (38% within 5 km of the facilities compared to 29% nationwide), 7 percentage points greater than its corresponding nationwide percentage for people of color (47% within 5 km of the facilities compared to 40% nationwide), 7 percentage points greater than its corresponding nationwide percentage for the African American population (19% within 5 km of the facilities compared to 12% nationwide), 6 percentage points greater than its corresponding nationwide percentage for people living below the poverty level (19% within 5 km of the facilities compared to 13% nationwide), 3 percentage points greater than its corresponding nationwide percentage for people over 25 years of age without a high school diploma (15% within 5 km of the facilities compared to 12% nationwide), 2 percentage points greater than its corresponding nationwide percentage for the Hispanic or Latino population (21% within 5 km of the facilities compared to 19% nationwide), and 2 percentage points greater than its corresponding nationwide percentage for

people younger than 18 years of age (24% within 5 km of the facilities compared to 22% nationwide). The remaining demographic groups within 5 km of facility operations are less than or within one percentage point of the corresponding nationwide percentages.

Based on the 2020 Census, there are approximately 55,520,600 people residing within 50 km of the 96 HWC facilities. The proximity results presented in Table 2 indicate that the population percentage for one demographic group within 50 km of these 96 facilities is greater than the corresponding nationwide percentage. The demographic percentage for populations residing within 50 km of the facility operations is 2 percentage points greater than its corresponding nationwide percentage for the African American population (14% within 50 km of the facilities compared to 12% nationwide). The remaining demographic percentages within 50 km of the facilities are less than or within one percentage point of the corresponding nationwide percentages.

Population Basis <sup>(a)</sup>	Total	People of Color <sup>(b)</sup>	African American	Native American	Other and Multiracial	Hispanic or Latino <sup>(c)</sup>	Ages 0 to 17	Ages 18 to 64	Ages 65 and up	Below the Poverty Level	Below Twice the Poverty Level	Over 25 Without a HS Diploma	Linguistic Isolation <sup>(d)</sup>
Nationwide Demographics (2016–2020 ACS)	329,824,950	40%	12%	0.6%	9%	19%	22%	62%	16%	13%	29%	12%	5%
Nationwide Block Counts (2020 Decennial Census) <sup>(e)</sup>	334,753,155					_			_	_		_	_
HWC Source Category (96 facilities) 50 km Proximity <sup>(f)</sup>	55,520,566	38%	14%	0.3%	8%	14%	22%	62%	16%	12%	28%	10%	4%
HWC Source Category (96 facilities) <b>5 km Proximity</b> <sup>(f)</sup>	1,772,399	47%	19%	0.3%	7%	21%	24%	62%	14%	19%	38%	15%	5%

# Table 2. Summary of Demographic Assessment for the Hazardous Waste Combustor (HWC) Source Category: Proximity Statistics by Demographic Group for All Facilities

(a) The demographic percentages are based on the Census' 2016-2020 American Community Survey (ACS) five-year averages at the block group level. The nationwide demographics include the 50 states, the District of Columbia, and Puerto Rico. Demographic percentages based on different averages may differ. The total population of each facility and of the entire run group (source category) are based on block level data from the 2020 Decennial Census. Populations by demographic group for each facility and for the source category are determined by multiplying each 2020 Decennial block population within the indicated radius by the ACS demographic percentages describing the block group containing each block, and then summing over the appropriate area (facility-specific or source category-wide).

(b) The People of Color population is the total population minus the white population.

(c) To avoid double counting, the "Hispanic or Latino" category is treated as a distinct demographic category for these analyses. A person is identified as one of five racial/ethnic categories above: White, African American, Native American, Other and Multiracial, or Hispanic/Latino. A person who identifies as Hispanic or Latino is counted as Hispanic/Latino for this analysis, regardless of what race this person may have also identified as in the Census.

(d) The linguistically isolated population is estimated at the block group level by taking the product of the block group population and the fraction of linguistically isolated households in the block group, assuming that the number of individuals per household is the same for linguistically isolated households as for the general population, and summed over all block groups.

(e) The nationwide 2020 Decennial Census population of 334,753,155 is the summation of all Census block populations within the 50 states, the District of Columbia, and Puerto Rico. Note that the nationwide population based on the 2020 Decennial Census is greater than the nationwide population based on the five-year 2016-2020 ACS averages, because the populations in most states have increased over this five-year period.

(f) The population tally and demographic analysis of the total population surrounding all facilities as a whole (source category-wide) takes into account neighboring facilities with overlapping study areas and ensures populations in common are counted only once.

## 5. Uncertainty Discussion

Our analysis of the distribution of population across various demographic groups is subject to the typical uncertainties associated with census data (e.g., errors in filling out and transcribing census forms), which are generally thought to be small, as well as the additional uncertainties associated with the extrapolation of census block group data down to the census block level.

The methodology for our demographic analyses applies demographic data from the Census American Community Survey (ACS). While this is our best attempt to provide useful information now, our thinking is continuously advancing. The EPA has developed technical guidance for environmental justice analyses. We present these analyses, with their associated uncertainties, to EPA decision makers and the public as additional analyses to inform Risk and Technology Review decisions.

# **Appendix: Analyzed Facilities**

A workbook of spreadsheets containing the detailed facility-specific results underpinning the results presented in this report is provided in the following file in the Regulations.gov docket for this proposed rule at <u>https://www.regulations.gov/docket/EPA-HQ-OAR-2004-0022</u>:

• HWC Revised 2020 Proximity Tool Demographic Results.xlsx

The size of the dataset describing the demographics surrounding these 96 facilities at 5 km and 50 km makes the data more amenable to Excel<sup>®</sup> spreadsheets than a Word<sup>®</sup> document.