ICPSR | INTER-UNIVERSITY CONSORTIUM FOR POLITICAL AND SOCIAL RESEARCH

ICPSR 38585

National Neighborhood Data Archive (NaNDA): Primary and Secondary Roads by Census Tract and ZIP Code Tabulation Area, United States, 2010 and 2020

P.I. Documentation for Primary and Secondary Roads by Census Tract and ZIP Code Tabulation Area 2020 Data

Inter-university Consortium for Political and Social Research
P.O. Box 1248
Ann Arbor, Michigan 48106
www.icpsr.umich.edu

National Neighborhood Data Archive (NaNDA): Primary and Secondary Roads by Census Tract and ZIP Code Tabulation Area, United States, 2010 and 2020

Longrong Pan
University of Michigan. Institute for Social Research

Robert Melendez
University of Michigan. Institute for Social Research

Philippa Clarke
University of Michigan. Institute for Social Research

Grace Noppert
University of Michigan. Institute for Social Research

Lindsay Gypin
University of Michigan. Institute for Social Research

Terms of Use

Information about Copyrighted Content

National Neighborhood Data Archive (NaNDA): Primary and Secondary Roads by Census Tract and ZCTA, United States, 2020

Overview and Data Dictionary

Documentation Version: 1.0
Last updated: 02/19/2024

Dataset Overview

Description

This dataset contains measures of primary and secondary roads (highways and main arteries) per United States census tract or ZIP code tabulation area (ZCTA) in 2020. These measures may be used as a proxy for heavy traffic, high traffic speeds, and impediments to walking or biking. Variables include: counts of primary, secondary, and all streets per tract or ZCTA; total length of primary, secondary, and all streets per tract or ZCTA; ratio of primary and/or secondary road counts to all streets; and ratio of length of primary/secondary roads to all streets.

Principal Investigators

- Longrong Pan, University of Michigan Institute for Social Research
- Robert Melendez, University of Michigan Institute for Social Research
- Philippa Clarke, University of Michigan Institute for Social Research
- Grace Noppert, University of Michigan Institute for Social Research
- Lindsay Gypin, University of Michigan Institute for Social Research

Funding Sources

- National Institutes of Health/National Institute of Nursing Research and the National Institute on Minority Health and Health Disparities (NINR/ NIMHD U01NR020556)

Data Sources

Data on road types and lengths is taken from the U.S. Census Bureau's TIGER/Line shapefiles, specifically the Index of TIGER/Line Shapefiles TRACT (United States Census Bureau, 2021a) and ZCTA520 (United States Census Bureau, 2021c) as well as the Topological Faces (United States Census Bureau, 2021b) shapefiles for 2020 census geography. Classification of roads as primary or secondary is based on the MAF/TIGER Feature Class Code (MTFCC), a five-character code (S1100 Primary Road, S1200 Secondary Road) used to classify features of the landscape and built environment (United States Census Bureau, 2021d).

Coverage

The dataset contains one observation per census tract or ZCTA in the fifty United States including Alaska, Hawaii, and US island territories.

Methodology

This dataset is one of several created to investigate the impact of disamenities (Weiss et al., 2011) on neighborhood walkability. Walkability blends geography, urban planning, and public health to measure how friendly an area is to walking through built and social environmental features such as pedestrian street design, transit nodes, land use mix, parks, greenspace, and welcoming public spaces (Chudyk et al., 2017; Sallis, 2009). However, neighborhood disamenities such as crime, pedestrian safety (e.g. due to high volumes of traffic), and noxious land uses might inhibit walkability by dissuading people from using neighborhood resources such as parks and recreational facilities (Weiss et al., 2011). Studies have found an inverse relationship between perceptions of traffic/busy roads and walking for transit and recreation (Owen et al., 2004). High traffic volume especially limits walkability for older adults and people with disabilities (Early et al., 2021; Owen et al., 2004; Rosenberg et al., 2013). In addition, residence in neighborhoods with a high density of traffic and industrial facilities has been shown to contribute to chronic respiratory morbidity in children, which may have broad implications for other urban populations that commonly have high asthma prevalence and exposure to a high density of traffic and stationary air pollution sources (Patel et al., 2011).

This dataset aims to describe the number and proportion of primary and secondary roads per census tract or ZCTA in the United States. Primary roads (MTFCC code S1100) are limited-access highways with on- and off-ramps and are typically part of the interstate or state highway system. Secondary roads (S1200) have two or more lanes, intersect directly with other roads, and are generally part of a state or county road system. (By contrast, there are also local neighborhood roads, rural routes, and city

streets which accommodate local traffic within a neighborhood, and other road features such as service roads, alleys, ramps, and walking/biking paths.)

To create these measures, we used ArcGIS Pro and the 2020 TIGER/Line all lines (edges) shapefiles for all counties to identify edges that represent three types of roads: primary roads (MTFCC = S1100), secondary roads (MTFCC = S1200), and all streets (MTFCC starts with S). We assigned roads to census tracts using the TIGER/Line topological faces shapefile. Using Stata version 18, we aggregated the total number and length of all streets, primary roads, secondary roads, and primary or secondary roads per census tract. We also calculated ratios of total primary and/or secondary roads to all streets, as well as ratios of primary and/or secondary road length to total street length.

Usage Notes

Zip Codes and ZIP Code Tabulation Areas

Users should be aware that ZCTAs are not equivalent to ZIP codes. ZIP codes are linear mail delivery routes created by the US Postal Service. ZIP code tabulation areas are spatial features consisting of census blocks grouped by the predominant ZIP code found on the block (United States Census Bureau, 2023).

In some cases, a location's address is not the same as its ZCTA. For example, some ZIP codes represent single-point addresses such as large post offices or office buildings. Also, the ZIP code for an address may not match its ZCTA if the ZIP code is not the most common ZIP code on the block. See the Census Bureau's ZCTA overview (United States Census Bureau, 2023) for more information on how ZCTA boundaries are calculated.

Users wanting to combine this dataset with ZIP code geocoded data must use a ZIP code to ZCTA crosswalk. Such a crosswalk is available on the UDS Mapper website (John Snow, Inc, 2023). Sample code for merging the UDS Mapper crosswalk with NaNDA datasets is available in the ICPSR Linkage Library (Chenoweth & Khan, 2021).

Census Tract Variables

Variable	Type	Label
tract_fips20	str11	Census tract FIPS code (2020 TIGER/Line shapefiles)
n_streets	float	Number of streets in tract
sum_strintlen	float	Total length of streets within tract (meters)
n_primary_roads	float	Number of primary roads in tract
n_secondary_roads	float	Number of secondary roads in tract
n_prim_sec_roads	float	Number of primary or secondary roads in tract
prop_primary_roads	float	Proportion of primary roads in tract (n_primary_roads/n_streets)
prop_secondary_roads	float	Proportion of secondary roads in tract (n_secondary_roads/n_streets)
prop_prim_sec_roads	float	Proportion of primary or secondary roads in tract (n_prim_sec_roads/n_streets)
sum_strlen_primary	float	Total length of primary roads in tract
sum_strlen_secondary	float	Total length of secondary roads in tract
sum_strlen_prim_sec	float	Total length of primary or secondary roads in tract
prop_strlen_primary	float	Prop. primary road length in tract (sum_strlen_primary/sum_strintlen)
prop_strlen_secondary	float	Prop. secondary road length in tract (sum_strlen_secondary/sum_strintlen)
prop_strlen_prim_sec	float	Prop. primary/secondary road length in tract (sum_strlen_prim_sec/sum_strintlen)

ZCTA Variables

Variable	Type	Label
zcta20	str5	ZIP code tabulation area (2020 TIGER/Line shapefiles)
n_streets	float	Number of street segments in ZCTA
sum_strintlen	float	Total length of street segments within ZCTA (meters)
n_primary_roads	float	Number of primary roads in ZCTA
n_secondary_roads	float	Number of secondary roads in ZCTA
n_prim_sec_roads	float	Number of primary or secondary roads in ZCTA
prop_primary_roads	float	Proportion of primary roads in ZCTA (n_primary_roads/n_streets)
prop_secondary_roads	float	Proportion of secondary roads in ZCTA (n_secondary_roads/n_streets)
prop_prim_sec_roads	float	Proportion of primary or secondary roads in ZCTA (n_prim_sec_roads/n_streets)
sum_strlen_primary	float	Total length of primary roads in ZCTA
sum_strlen_secondary	float	Total length of secondary roads in ZCTA
sum_strlen_prim_sec	float	Total length of primary or secondary roads in ZCTA
prop_strlen_primary	float	Prop. primary road length in ZCTA (sum_strlen_primary/sum_strintlen)
prop_strlen_secondary	float	Prop. secondary road length in ZCTA (sum_strlen_secondary/sum_strintlen)
prop_strlen_prim_sec	float	Prop. primary/secondary road length in ZCTA (sum_strlen_prim_sec/sum_strintlen)

References

Chenoweth, M., & Khan, A. (2021). *National Neighborhood Data Archive (NaNDA): Code for merging ZCTA level datasets with the UDS Mapper ZIP code to ZCTA crosswalk* (Version v2) [dataset]. ICPSR - Interuniversity Consortium for Political and Social Research. https://doi.org/10.3886/E120088V2

Chudyk, A. M., McKay, H. A., Winters, M., Sims-Gould, J., & Ashe, M. C. (2017). Neighborhood walkability, physical activity, and walking for transportation: A cross-sectional study of older adults living on low income. *BMC Geriatrics*, *17*(1), 82. https://doi.org/10.1186/s12877-017-0469-5

Early, A., Suarez-Balcazar, Y., & Arias, D. (2021). Latinx Parents' Perceptions of Neighborhood Walking Safety for Their Youth With Intellectual Disabilities: A Mixed-Methods Investigation. *Family & Community Health*, *44*(1), 10. https://doi.org/10.1097/FCH.0000000000000274

John Snow, Inc. (2023). *ZIP Code to ZCTA Crosswalk – UDS Mapper*. American Academy of Family Physicians. https://udsmapper.org/zip-code-to-zcta-crosswalk/

Owen, N., Humpel, N., Leslie, E., Bauman, A., & Sallis, J. F. (2004). Understanding environmental influences on walking: Review and research agenda. *American Journal of Preventive Medicine*, *27*(1), 67–76. https://doi.org/10.1016/j.amepre.2004.03.006

Patel, M. M., Quinn, J. W., Jung, K. H., Hoepner, L., Diaz, D., Perzanowski, M., Rundle, A., Kinney, P. L., Perera, F. P., & Miller, R. L. (2011). Traffic density and stationary sources of air pollution associated with wheeze, asthma, and immunoglobulin E from birth to age 5 years among New York City children. *Environmental Research*, *111*(8), 1222–1229. https://doi.org/10.1016/j.envres.2011.08.004

Rosenberg, D. E., Huang, D. L., Simonovich, S. D., & Belza, B. (2013). Outdoor Built Environment Barriers and Facilitators to Activity among Midlife and Older Adults with Mobility Disabilities. *The Gerontologist*, *53*(2), 268–279. https://doi.org/10.1093/geront/gns119

Sallis, J. F. (2009). Measuring physical activity environments: A brief history. *American Journal of Preventive Medicine*, *36*(4 Suppl), S86-92. https://doi.org/10.1016/j.amepre.2009.01.002

United States Census Bureau. (2021a, February 1). *Index of TIGER/Line Shapefiles: Census Tract*. https://www2.census.gov/geo/tiger/TIGER2020/TRACT/

United States Census Bureau. (2021b). *Index of TIGER/Line shapefiles: Topological Faces (Polygons with All Geocodes)*. https://www2.census.gov/geo/tiger/TIGER2020/FACES/

United States Census Bureau. (2021c, July 15). *Index of Tiger/Line Shapefiles: ZCTA*. https://www2.census.gov/geo/tiger/TIGER2020/ZCTA520/

United States Census Bureau. (2021d). *2020 MAF/TIGER Feature Class Codes*. United States Census Bureau. https://www2.census.gov/geo/pdfs/reference/mtfccs2020.pdf

United States Census Bureau. (2023, August 10). *ZIP Code Tabulation Areas (ZCTAs)*. Census.Gov. https://www.census.gov/programs-surveys/geography/guidance/geo-areas/zctas.html

Weiss, C. C., Purciel, M., Bader, M., Quinn, J. W., Lovasi, G., Neckerman, K. M., & Rundle, A. G. (2011). Reconsidering Access: Park Facilities and Neighborhood Disamenities in New York City. *Journal of Urban Health*, *88*(2), 297–310. https://doi.org/10.1007/s11524-011-9551-z