2006 NCHS Urban-Rural Classification Scheme for Counties

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Abstract

NCHS data systems are often used to study the association between urbanization level of residence and health and to monitor the health of urban and rural residents. Conducting such analyses requires an urban-rural classification scheme. This report describes a six-level urban-rural classification scheme developed by the National Center for Health Statistics for the 3,141 U.S. counties and county-equivalents. The most urban category consists of large metropolitan central counties and the most rural category consists of nonmetropolitan noncore counties.

The county classifications are based on the following information: (1) the 2003 Office of Management and Budget (OMB) definitions of metropolitan and nonmetropolitan counties (with revisions through 2005); (2) the Rural-Urban Continuum Codes and the Urban Influence Codes classifications developed by the Economic Research Service of the U.S. Department of Agriculture; and (3) county-level data on several variables from Census 2000 and 2004 postcensal population estimates.

This classification scheme, unlike others that have been developed since 2003, separates large metropolitan counties into two categories: large metro central and large metro fringe. These two categories were created because of striking differences in several health measures between residents of these two types of counties. Discriminant analysis was used to verify the classification of counties into these two categories.

1. Background

1.1 *Urbanization level and health*

Communities in the United States differ considerably on measures of health. Urbanization level has long been recognized as a key characteristic when studying health disparities among communities. In the United States, residents in “rural” areas tend to have poorer health than those in more urbanized areas (1-3). In addition, residents of central cities in metropolitan areas of 1 million or more population fare worse on many health measures than do residents of the suburban areas surrounding the central cities. Identifying and understanding the underlying causes of the health disparities among communities is key in designing effective public health policies and interventions (4).

1.2 *County as building block*

Numerous classification schemes have been devised to categorize communities by urbanization level (2, 3, 5-9). In the United States the geographic unit used in most

of these classification schemes is the county (local designation may be county, parish, borough), largely because of the relative stability of county boundaries. In addition, except in New England, counties and equivalent entities generally are the primary political units of local government and have programmatic importance at the federal and state levels. Further, county-level measures of health, social, and economic characteristics are widely available, in contrast to the paucity of data available at the sub-county level.

1.3 *Definition of Metropolitan and Nonmetropolitan Counties*

Many of the urbanization classification schemes make use of the Office of Management and Budget's (OMB) metropolitan statistical area designations. The OMB metropolitan-nonmetropolitan designations use the county as the basic building block. OMB defines metropolitan statistical areas according to published standards that are applied to Census Bureau data. A metropolitan, or metro, area is defined as a core area containing a large population nucleus together with adjacent communities having a high degree of economic and social integration with that core. All counties within a metropolitan statistical area are classified as metropolitan. Counties not within a metropolitan statistical area are considered nonmetropolitan.

While the basic concept of the metropolitan statistical area has not changed since its inception, the specific criteria for defining these areas have been revised periodically, generally prior to a decennial census. Thus, urbanization classification schemes based on the OMB metropolitan statistical areas must be updated periodically to reflect both changes in the criteria used to determine the metropolitan or nonmetropolitan status of counties and changes in population. The most recent OMB metropolitan area standards were adopted in December 2000 and new areas resulting from applying these standards to the 2000 census were released in June 2003, and updated several times subsequently (10-15). The 2000 standards reflect extensive modification of the rules governing metropolitan status, including simplification of the classification criteria and the addition of a new category for some of the nonmetropolitan counties. The new category is used to subdivide the previously undifferentiated nonmetropolitan territory into two distinct types of counties, micropolitan counties and counties outside core-based statistical areas (hereafter referred to as "noncore").

The 2000 OMB standards specify that a metropolitan statistical area contains at least one urbanized area of 50,000 or more people, as defined by the Census Bureau, and consists of:

1) central counties and
2) outlying counties that are economically and socially tied to the central counties, as measured by work commuting.

The Census Bureau defines an urbanized area as an urban nucleus with a population density of 1,000 persons per square mile together with adjoining territory with at least 500 persons per square mile, which together have a total population of at least 50,000.

An urbanized area may or may not contain a city of 50,000 or more (11). A county is included in a metropolitan statistical area as an outlying county if at least 25% of workers residing in the county commute to the central counties or if at least 25% of the employment in the county consists of workers commuting out from the central counties. The 2000 standards, for the first time, create two classes of nonmetropolitan counties. Those with urban clusters of 10,000 or more persons are designated as micropolitan. All remaining nonmetropolitan nonmicropolitan counties are called noncore counties. In the 2000 standards, the largest incorporated city in each metropolitan and micropolitan statistical area is designated as a "principal city". Additional cities qualify if specified population size and commuting criteria are met. Principal cities are identified because they represent the most important social and economic centers within the metropolitan or micropolitan statistical area.

One difference between the 2000 standards for metropolitan and micropolitan statistical areas and previous standards is that the 2000 standards use urbanized areas to identify metropolitan areas, whereas previous standards relied primarily on incorporated cities, and, less commonly, urbanized areas to identify metropolitan areas. Another difference between the 2000 and previous standards is that under the 2000 standards, inclusion of an outlying county in a metropolitan statistical area is based on a single commuting threshold of 25% with no "metropolitan character" requirement. Metropolitan character, which is based on population density, urbanization, and population growth, is a construct defined and used in previous standards. Earlier standards classified a county with as little as 15% of its workers commuting to another county for work as an outlying county in a metropolitan statistical area provided the county had a high level of metropolitan character, and classified a county low in metropolitan character as nonmetropolitan no matter how high its commuting linkage was to the central county or counties.

The changes in the rules for defining metropolitan statistical areas had relatively little impact on the classification of formerly metropolitan counties. Most counties that qualified as metropolitan under the 1990 standards also qualified under the 2000 standards because most urbanized areas that meet the 2000 size standards contain cities of 50,000 or more people. The small number of previously metropolitan counties that failed to qualify as metropolitan under the 2000 standards, failed because of the higher commuting threshold. Quite a few formerly nonmetropolitan counties became metropolitan under the 2000 standards. Some qualified as metropolitan because of population growth and/or the use of urbanized area population, rather than incorporated city population, to assess metropolitan status. These counties became new single county metropolitan statistical areas or part of new multi-county metropolitan statistical areas. Most of the formerly nonmetropolitan counties that qualified as metropolitan under the 2000 standards did so either because of increased commuting by their residents or because there was no metropolitan character requirement in the 2000 standards. These counties became outlying counties in existing metropolitan statistical areas.

1.4 *Urban-rural classification schemes based on the 2000 census*

With the release of Census 2000 population data, urban and rural classification schemes based on the 1990 census needed to be updated. Additionally, with the subsequent release of the metropolitan and micropolitan statistical area definitions based on the 2000 OMB standards, classification schemes that use metropolitan/nonmetropolitan status to classify counties needed to incorporate these new definitions. The Economic Research Service (ERS) of the Department of Agriculture produces several county urban-rural classification schemes, including the Rural-Urban Continuum codes and the Urban Influence codes (5, 7). Both the Rural-Urban Continuum Codes and the Urban Influence Codes classify counties based on their metropolitan/nonmetropolitan status as defined using the OMB standards and census population counts. NCHS has used an urban-rural classification scheme derived by categorizing counties based on a combination of the 1993 Rural-Urban Continuum Code and Urban Influence Codes, for various reports including the *Health, United States, 2001 Urban and Rural Health Chartbook* (2).

1.4.1 2003 Rural-Urban Continuum Codes - The 2003 Rural-Urban Continuum Codes classification has nine levels, three for metropolitan counties and six for nonmetropolitan counties (Table 1). Classification of the metropolitan counties is based on the population size of their metropolitan statistical area, small (population 50,000 to 249,999), medium (population 250,000 to 999,999), and large (population of 1 million or more). In previous versions of this classification scheme, the large metro category was further divided into a “central” category, for central counties of the metropolitan statistical area, and a “fringe” category for outlying counties of the metropolitan statistical area (with central and fringe status defined in accordance with the OMB standards). For the 2003 Rural-Urban Continuum Codes, ERS did not divide the large metro category into the central and fringe categories because definition changes in the 2000 OMB standards resulted in most large metro counties being designated as central counties. ERS found that when the definitions in the 2000 OMB standards were used to designate central status, 98.4% of the population of the large metro areas was in central counties, and therefore, the fringe category was meaningless (5). ERS classified the nonmetropolitan counties into six categories based on population size (less than 2,500; 2,500 to 19,999; and 20,000 or more) and adjacency to a metropolitan statistical area.

1.4.2 2003 Urban Influence Codes - The 2003 Urban Influence codes classification has 12 levels, two for metropolitan counties and ten for nonmetropolitan counties (Table 1). Metropolitan counties are classified based on the population size of their metropolitan statistical area, small (population 50,000 to 999,999) and large (population of 1 million or more). Nonmetropolitan counties are categorized based on the size of their urban population (micropolitan, noncore) and adjacency to a metropolitan or micropolitan statistical area (adjacent to a large metro area, adjacent to a small metro area, adjacent to a micropolitan area, not adjacent). Nonmetropolitan noncore counties are further divided based on the presence or absence of a town of 2,500 or more residents. The two metropolitan categories used in the 2003 classification scheme are the same as those used in previous versions of the scheme. Most of the

Table 1. Comparison of urban and rural classification schemes			
Metropolitan status	ERS 2003 Rural-Urban Continuum Codes[1]	NCHS 2006 Urban-Rural Classification	ERS 2003 Urban Influence Codes
Metropolitan	Counties in metro area of >= 1 million population	**"Central" counties of metro area of >=1 million population**	Counties in metro area of >= 1 million population
		"Fringe" counties of metro area of >=1 million population	
	Counties in metro area of 250,000-999,999 population	Counties in metro area of 250,000-999,999 population	Counties in metro area of 50,000-249,999 population
	Counties in metro area of 50,000-249,999 population	Counties in metro area of 50,000-249,999 population	
Nonmetropolitan		Micropolitan counties	Micropolitan counties, adjacent to metro area of >=1 million population
			Micropolitan counties, adjacent to metro area of 50,000-999,999 population
	Counties with urban population of 20,000-49,999, adjacent to metro area		Micropolitan counties, not adjacent to a metro area
	Counties with urban population of 20,000-49,999, not adjacent to metro area	Noncore counties	Noncore counties, adjacent to metro area of >=1 million population
	Counties with urban population of 2,500-19,999, adjacent to metro area		Noncore counties with a town of 2,500-9,999, adjacent to metro area of 50,000-999,999 population
	Counties with urban population of 2,500-19,999, not adjacent to metro area		Noncore counties without a town of 2,500-9,999, adjacent to metro area of 50,000-999,999 population
	Counties with urban population under 2,500, adjacent to metro area		Noncore counties with a town of 2,500-9,999, adjacent to a micropolitan county
	Counties with urban population under 2,500, not adjacent to metro area		Noncore counties without a town of 2,500-9,999, adjacent to a micropolitan county
			Noncore counties with a town of 2,500-9,999, not adjacent to metro area or micropolitan county
			Noncore counties without a town of 2,500-9,999, not adjacent to metro area or micropolitan county

[1]The nonmetropolitan categories of the Rural-Urban Continuum codes do not align with those of the other two classifications.

nonmetropolitan categories in the 2003 scheme are roughly comparable with categories in previous versions, but because the 2003 scheme has ten nonmetropolitan categories and previous versions had seven, some categories in the 2003 version have been further divided.

2. NCHS Urban-Rural Classification scheme based on the 2000 census

2.1 *Overview*

NCHS has developed a county-level urbanization classification scheme based on the 2000 census for use in studying the association between urbanization and health. The scheme, the 2006 NCHS Urban-Rural Classification, divides the 3,141 U.S. counties and county equivalents into six categories, four metropolitan and two nonmetropolitan (Table 1). The metropolitan categories are defined using the population size cut points used by ERS for the 2003 Rural-Urban Continuum Codes (50,000 to 249,999; 250,000 to 999,999; and 1 million or more). However, unlike the 2003 Rural-Urban Continuum Codes, the NCHS classification subdivides counties in the largest metropolitan areas (1 million or more population) into two subcategories. The two nonmetropolitan levels of the NCHS classification, micropolitan and noncore, are derived directly from the differentiation of nonmetropolitan territory specified in the 2003 OMB standards for defining metropolitan and micropolitan counties. ERS also divided the nonmetropolitan counties into micropolitan and noncore counties for the 2003 Urban Influence Codes.

When developing this urbanization classification, NCHS examined the feasibility and desirability of separating the large metro counties into a large central metro category and a large fringe metro category because important health differences have been found for central and fringe counties in the past. The decision to subdivide the large metro category was made after several questions were explored:

1) Could simple and reasonable classification rules be formulated that would separate counties at the center of the largest metropolitan statistical areas (those containing large portions of the area's population) from "suburban" counties of the metropolitan statistical area? The definitions for central and outlying counties in the 2000 OMB standards could not be used to accomplish this separation because, as noted above, under the 2000 OMB standards, nearly all metropolitan counties are central.

2) Given the changes over the past decade in the character of metropolitan areas, are the counties in the large central and large fringe categories that result from applying the classification rules sufficiently different in character to warrant their continued separation?

3) Do the differentials in health measures that have been observed in the past for these two urbanization categories still exist?

A discriminant analysis was used to determine whether key settlement density, socioeconomic, and demographic variables from Census 2000 could be used to classify large metro counties into the central and fringe categories and if so, how closely the classification obtained from the discriminant analysis agreed with that obtained using the classification rules.

Counties assigned to the central and fringe categories were compared on various density, socioeconomic, and demographic variables to see if there continue to be differences between these two sets of counties that are substantial enough to warrant their separation.

Finally, death rates for motor vehicle deaths, homicide, and ischemic heart disease were computed for all six categories in the urban and rural classification scheme to determine whether health differentials observed in the past across categories still exist.

2.2 *Classification rules and data used in derivation of NCHS Urban-Rural Classification*

The classification rules given in Table 2 were used to assign all U.S. counties and county equivalents into the six urbanization categories. The December 2005 OMB definitions of metropolitan and micropolitan statistical areas were used to determine each county's metropolitan, micropolitan, or noncore status (15). The Vintage 2004 series of postcensal population estimates of the July 1, 2004 resident population of counties was used to derive the population of each metropolitan statistical area (16). The Vintage 2004 estimates of the population of places were used to derive the population of the principal cities of large metro areas (1 million or more residents) (17).

Table 2. Classification rules used to assign counties to the six urbanization levels of the 2006 NCHS Urban-Rural Classification	
Urban-rural category	Classification rules
Metropolitan	
Large central metro[1]	Counties in a metropolitan statistical area of 1 million or more population:) that contain the entire population of the largest principal city of the metropolitan statistical area, or) whose entire population resides in the largest principal city of the metropolitan statistical area, or) that contain at least 250,000 of the population of any principal city in the metropolitan statistical area
Large fringe metro	Counties in a metropolitan statistical area of 1 million or more population that do not qualify as large central
Medium metro	Counties in a metropolitan statistical area of 250,000 to 999,999 population
Small metro	Counties in a metropolitan statistical area of 50,000 to 249,999 population
Nonmetropolitan	
Micropolitan	Counties in a micropolitan statistical area
Noncore	Counties that are neither metropolitan nor micropolitan

[1]There must be at least one large central county in each large metro area.

2.3 *Urbanization categories for large metropolitan counties*

Application of the classification rules to the 417 large metropolitan counties resulted in the assignment of 59 counties to the large central metro category and 358 counties to the large fringe metro category (Table 3).

Table 3. Comparison of the assignment of large metro counties to the large central and large fringe categories by the classification rules and by the discriminant model			
Assignment by classification rules	Assignment by discriminant model		
Urban-rural category	Large metro	Large central metro	Large fringe metro
Large metro	417	65	352
Large central metro	59	57[1]	2[2]
Large fringe metro	358	8[2]	350[1]

[1]Counties for which assignment by the classification rules agrees with assignment by discriminant model.
[2]Counties for which assignment by the classification rules disagrees with assignment by discriminant model.

2.3.1 Discriminant model classification of large metro counties - A stepwise discriminant analysis was performed using SAS PROC STEPDISC to determine which variables to use in the discriminant model to differentiate between the two types of large metropolitan counties (18). Using county-level data derived from Census 2000 and

from the Vintage 2004 postcensal estimates of the resident population of the United States, the variables considered for the discriminant model were:

- population of the metropolitan area as of July 1, 2004
- population of the county as of July 1, 2004
- population density (number of people residing per square mile)
- housing density (number of housing units per square mile)
- mean housing density of urban blockgroups (number of housing units per square mile for all blockgroups with >=640 housing units per square mile)
- percentage of county area (sum of blockgroups) with >=640 housing units per square mile
- crowded housing conditions (percentage of housing units with more than one person per room)
- percentage of housing units that are owner occupied
- percentage of county residents commuting outside the county for work
- ratio of jobs to workers in the county
- median household income in the county
- percentage of county residents living below poverty
- percentage of households with an income below the median U.S. household income
- percentage of county population that is non-Hispanic white
- percentage of county population that is non-Hispanic black
- percentage of county population that is American Indian or Alaska Native
- percentage of county population that is Asian or Pacific Islander
- percentage of county population that is Hispanic
- percentage of county population that is multiple-race
- percentage of county population that is foreign born
- Deprivation Index (19, 20)
- Dissimilarity Index, for Hispanics and for whites (21)
- Isolation Index, for Hispanics and for whites (21).

The stepwise discriminant analysis identified 16 variables as significant predictors of urbanization category: county population, metropolitan statistical area population, population density, percentage of county area in urban blockgroups and the mean density of these areas, percentage of county housing with more than one occupant per room, percentage of owner-occupied housing units, percentage commuting outside the county for work, ratio of jobs to workers in the county, median household income, percentage with an income below the median U.S. household income, percentage of the population that is white, percentage of the population that is multiple race, Isolation Index for white persons, the Dissimilarity Index for white persons, and the Deprivation Index. A discriminant model including these 16 variables was fit using SAS PROC DISCRIM.

The discriminant model classified 65 of the 417 large metro counties as large central metro and 362 as large fringe metro (Table 3). Thus, the discriminant model

successfully separated the large metro counties into the central and fringe categories using county-specific settlement density, socioeconomic, and demographic variables from Census 2000.

The classification recommended by the discriminant model agrees closely with the classification obtained by applying the classification rules (Table 3). There was disagreement between the two approaches on the assignment of only ten of the 417 large metro counties. Two of the ten counties on which there was disagreement, Providence, RI and Virginia Beach city, VA, were categorized as central by the classification rules and as fringe by the discriminant model; the remaining eight (Alexandria city, VA; DeKalb, GA; Hudson, NJ; Norfolk city, VA; Pinellas, FL; Pierce, WA; Portsmouth city, VA; and San Bernadino, CA) were categorized as fringe by the classification rules and as central by the discriminant model. Thus, the classification rules and the discriminant model reached the same conclusions on 57 of the large metro counties in the large central metro category and 350 in the large fringe metro category.

2.3.2 Resolution of large metro county assignments - Examination of the ten counties that were classified differently by the classification rules and the discriminant analysis resulted in the assignment of six of them to the large central metro category (Alexandria city, VA; Hudson, NJ; Norfolk city, VA; Pinellas, FL; Providence, RI; and Virginia Beach city, VA) and the remaining four to the large fringe metro category (DeKalb, GA; Pierce, WA; Portsmouth city, VA; and San Bernadino, CA). See Table 4. A detailed description of the evaluation of the assignments of these ten counties is provided in Appendix A.

Adjustment of the initial classification of these ten large metro counties resulted in a final classification with 63 counties in the large central metro category and 354 counties in the large fringe metro category.

Table 4. Initial assignment according to the classification rules and the discriminant model of the ten large metropolitan counties on which the two approaches disagreed, and final assignment of these counties

County name	Initial assignment, according to classification rules	Initial assignment, according to discriminant model	Final assignment
Alexandria city, VA	fringe	central	central
DeKalb, GA	fringe	central	fringe
Hudson, NJ	fringe	central	central
Norfolk city, VA	fringe	central	central
Pierce, WA	fringe	central	fringe
Pinellas, FL	fringe	central	central
Portsmouth city, VA	fringe	central	fringe
Providence, RI	central	Fringe	central
San Bernadino, CA	fringe	central	fringe
Virginia Beach city, VA	central	Fringe	central

2.3.3 Characteristics of large central and large fringe counties - Comparison of central and fringe county distributions for various settlement, socioeconomic, and demographic characteristics shows that central and fringe counties differ substantially on many of the characteristics. Table 5 shows the first quartile, median, and third quartile values for selected variables (means are not shown because the distributions of many variables are highly skewed). For many variables the interquartile portion of the fringe county distribution does not overlap that of the central county distribution.

Density - Central counties tend to be more densely settled than fringe counties, with a substantially higher population density, housing density, percentage of area in urban blockgroups, and housing density within urban blockgroups, as well as a larger percentage of housing units with crowded conditions.

Economic - Central counties tend to have substantially fewer residents commuting outside the county to work and a higher jobs-to-worker ratio than fringe counties. The median household incomes of central counties tend to be somewhat lower than those of fringe counties and the percentage of households with incomes below the national median is somewhat higher in central counties than in fringe counties, but the central and fringe county distributions for these two variables overlap considerably. However, economic differences between the central and fringe counties are evident when poverty measures are examined. The percentage of families with incomes below the poverty level and the percentage of people under 150% of poverty tend to be much higher in the central counties than in the fringe counties.

Demographic - Central counties tend to be much more racially and ethnically diverse than fringe counties as shown by comparing population distribution variables (percentage white, percentage black, percentage Asian, percentage multiple race, percentage Hispanic). Further, the percentage of the population that is foreign born tends to be considerably higher in central counties than in fringe counties. The Isolation Index for whites tends to be closer to 1 in fringe metro counties than in central metro counties, indicating that the probability of a white person meeting another white person in their census tract is higher in fringe counties than in central counties.

These findings show that central and fringe counties in the largest metropolitan areas continue to differ on key settlement, socioeconomic, and demographic characteristics and thus, support their continued separation.

2.4 *Urbanization categories for small and medium metro counties*

Metropolitan counties of less than 1 million population were divided into the medium metro (250,000-999,999 population) and small metro (50,000-249,999 population) categories for the NCHS Urban-Rural Classification. This was preferable to using a composite category as in the Urban Influence Codes, because medium and small metropolitan counties differ on a number of health measures.

Table 5. Median and first and third quartiles of key characteristics of large central and large fringe metropolitan counties

Variable	Large fringe counties			Large central counties		
	1st quartile	Median	3rd quartile	1st quartile	Median	3rd quartile
County population (July 1, 2004)	33,843	91,593	231,760	660,095	928,018	1,588,088
Density measures						
Population density (persons/sq. mile)	71	197	533	1,135	1,967	4,363
Housing density (housing units/sq. mile)	29	75	202	449	799	1,757
County area with >=640 houses per sq. mile (%)	0.1	2	8	21	34	67
Housing density (houses/sq. mile) within areas with >=640 houses/sq. mile	840	1,148	1,437	1,747	2,165	3,310
Households with >1 person/room (%)	1.7	2.4	3.9	3.7	5.8	9.3
Economic measures						
Commute outside county to work (%)	44	54	62	8	16	33
Jobs to workers in county ratio	0.6	0.7	0.9	1.0	1.2	1.3
Unemployed (%)	3	4	5	5	6	8
Owner-occupied housing units (%)	72	77	81	50	59	63
Median household income	$40,328	$47,278	$58,397	$39,478	$41,988	$47,024
Households with income below national median (%)	32	42	51	36	44	54
Families under poverty level (%)	4	6	8	8	10	13
Persons under 150% of poverty level (%)	11	15	20	19	21	26
High school education or more (%)	77	82	87	766	81	83
Population distribution						
Percentage white	74.	87	94	44	57	71
Percentage black	1	5	13	9	19	28
Percentage Asian	0.4	0.8	2.2	2.3	3.4	6.4
Percentage Hispanic	1	2	6	4	12	24
Percentage multiple race	0.7	0.9	1.2	1.1	1.3	1.9
Percentage foreign born	1	2	5	5	8	17
Isolation Index for whites	0.78	0.87	0.94	0.63	0.72	0.81

2.5 *Urbanization categories for nonmetropolitan counties*

Both size of the urban population and adjacency to a metropolitan or micropolitan area are used to define the nonmetropolitan categories in the Rural-Urban Continuum Codes and the Urban Influence Codes. For the NCHS Urban-Rural Classification, only one of these two variables could be used because the number of nonmetropolitan categories in the NCHS classification was limited to two. The relatively small population of nonmetropolitan counties limits the number of categories into which the nonmetropolitan counties can be subdivided and still have large enough counts to compute reliable statistics. For the NCHS Urban-Rural Classification, size of the urban population in the county rather than adjacency to a metropolitan area is used to separate the nonmetropolitan counties. In the past, NCHS has found that size of the urban population is more important than adjacency when studying associations between urbanization and health. Comparison of death rates in 2000-2002 for adjacent/nonadjacent nonmetropolitan counties with those for micropolitan/noncore counties confirmed that this is still the case. Therefore, the two nonmetropolitan categories used in the 2006 NCHS scheme are micropolitan and noncore.

2.6 *Final assignment of all counties to urbanization levels*

The final assignment of the 3,141 counties and county equivalents to the six urbanization levels is based on the application of the classification rules, with adjustments of the assignment of four large metro counties. The final classification assigns 63 counties to the large central metro category, 354 to the large fringe metro category, 332 to the medium metro category, 341 to the small metro category, 694 to the micropolitan category, and 1,357 to the noncore category (Table 6).

Table 6. Number of counties and percentage of population in each of the urbanization levels of the NCHS Urban-Rural Classification

Urban-rural category	Number of counties[1]	Percentage of July 1, 2004 population
Metropolitan	1,090	83.0
Large metro	417	53.7
Central	63	29.6
Fringe	354	24.1
Medium metro	332	19.8
Small metro	341	9.5
Nonmetropolitan	2,051	16.9
Micropolitan	694	10.3
Noncore	1,357	6.6

[1]Broomfield, CO is on the file; Clifton Forge, VA is not.

3. Example: Mortality by urbanization level

Table 7 shows age-adjusted death rates for motor vehicle traffic-related injuries, homicide, and ischemic heart disease for the six categories in the 2006 NCHS Urban-Rural Classification scheme. Examination of these health measures across the revised urbanization levels shows that the differentials that have been observed in the past still exist. In particular, there are still important health differences between the large metro central and fringe categories further demonstrating the importance of retaining these two categories rather than combining them.

3.1 *Motor vehicle traffic-related deaths*

Age-adjusted death rates for motor vehicle traffic-related injuries increase strongly as counties become less urban. The death rates in fringe counties are about 17% higher than those in central counties for males and about 23% higher for females. The differential between the rates in the central counties and those in the most rural counties (the noncore counties) are much larger. For males, the age-adjusted rate for motor vehicle traffic-related deaths in the noncore counties is more than twice the rate in the central counties of large metro areas. For females, the rate is almost three times higher in the noncore counties than it is in the central counties of large metro areas.

Table 7. Age-adjusted death rates for motor vehicle traffic-related injuries, homicide, and ischemic heart disease, according to sex and 2006 NCHS Urban-Rural Classification: United States, average annual 2000-2002

Urban-rural category	Motor vehicle, all ages[1]	Homicide, all ages[1]	Ischemic heart disease, 25 years and over[2]
		Males	
Large metro	16.9	12.2	360.3
Large central	16.0	16.3	377.6
Large fringe	18.8	6.9	339.8
Medium metro	22.1	7.9	333.6
Small metro	24.8	5.9	342.0
Micropolitan	31.1	6.3	366.9
Noncore	40.6	6.2	373.2
		Females	
Large metro	7.1	3.9	227.3
Large central metro	6.5	3.8	238.5
Large fringe metro	8.0	2.2	213.5
Medium metro	9.5	2.7	199.4
Small metro	11.1	2.5	197.2
Micropolitan	13.9	2.8	214.3
Noncore	19.2	3.1	215.9

[1] Death rates are age-adjusted.
[2] Death rates are for persons 25 years and over and are age adjusted.

3.2 *Homicide*

Age-adjusted homicide rates are substantially higher for the large central metro category than they are for any of the other urbanization levels. For males, the rate in the central counties is 136% higher than in the fringe counties and about 2 to 3 times higher than it is in the other urbanization levels. The urbanization pattern for females resembles that for males. However, because homicide rates for females are much lower than those for males, the absolute differences are smaller.

3.3 *Ischemic heart disease*

Differences in heart disease mortality by urbanization level have long been recognized. Ischemic heart disease death rates in men 25 years and over are highest in the central counties of large metro areas and noncore counties (about 11% higher than in fringe counties). For women 25 years and over, ischemic heart disease rates are highest in the central counties of the large metro areas (12% higher than in fringe counties). In addition, the rates for women in the fringe counties are higher than those in the medium and small metro categories and similar to the rates in micropolitan counties.

4. Summary

This report documents NCHS's development of a six-level urban-rural classification scheme for the 3,141 U.S. counties and county-equivalents based on the 2003 OMB definitions of metropolitan and micropolitan statistical areas (with revisions through December 2005), the 2003 Rural-Urban Continuum codes, the 2003 Urban Influence Codes, Census 2000 variables, and 2004 postcensal population estimates. The most urban category consists of large metropolitan central counties and the most rural category consists of nonmetropolitan noncore counties.

The 2006 NCHS Urban-Rural Classification, described in this report, can be applied to county-level data systems to study the association between urbanization level of residence and health and to monitor the health of urban and rural residents. Although the categories used in the classification are a composite of the Rural-Urban Continuum Codes and the Urban Influence Codes, the specific categories selected from each of these schemes were chosen for their utility in the study of health differences among communities. For example, the size of the urban population in a nonmetropolitan county was recognized to be a more important predictor of health measures than the adjacency of that county to a metropolitan area, hence the choice of micropolitan and noncore as the two nonmetropolitan categories.

This classification scheme, unlike others that have been developed since 2003, separates large metropolitan counties into two categories: large central metro and large fringe metro. Although in the past some classification schemes separated large metro counties into these two categories, they did not do so after 2000 because definitional

changes in the 2000 OMB standards for defining metropolitan areas made the fringe category meaningless. Because striking health differences between large central metro and large fringe metro counties have been found in the past, NCHS explored whether simple rules could be developed to separate large metro counties and whether the counties in the resulting categories would differ on key "metropolitan character" variables and health measures. NCHS's separation of the large metro counties into the large central metro and large fringe metro categories, using the rules described in this report, was found to result in sets of central and fringe counties that differed substantially on both "metropolitan character" variables and on health measures. Thus, the continued separation of the large metro category into these two categories was found to be feasible and desirable. The initial placement of the large metro counties into the two categories using the classification rules was verified by a discriminant analysis that used various settlement density, economic, and social variables.

External Review of 2006 Classification

The 2006 NCHS Urban-Rural Classification scheme was sent for review to three geographers who were on the Metropolitan Area Standards Review Committee: Calvin Beale, Economics Research Service of the USDA; John Cromartie, Economic Research Service, USDA; and Michael Ratcliffe, U.S. Census Bureau. The reviewers agreed with the overall approach. Comments received on the placement of some of the counties on which the classification rules and the discriminant analysis disagreed were followed in the final assignment of these counties.

Appendix A
Suggested Assignment of the Ten Potentially "Misclassified" Counties

The ten counties that were not classified the same way by the classification rules and the discriminant analysis were examined and a determination of their final classification was made as described below. Two counties were assigned to the large central category because they contained all of the population of the largest principal city in the metropolitan area. Four other counties were assigned to the large central category because of their high population and housing densities and because their measures on various socioeconomic and demographic variables were more in keeping with those of central counties than with those of fringe counties. The four remaining counties were assigned to the large fringe category because of their lower population and housing densities and because their measures on the socioeconomic and demographic variables tended to be more in keeping with those of fringe counties than with those of central counties. Tables A, B, and C show the values for the ten counties on various density, economic, and social variables and their ranks compared with central and fringe counties.

1. **Alexandria city, VA** (FIPS=51510). Final classification: **central**. Alexandria city is an independent city that is treated as a county equivalent. It is one of the 22 counties/independent cities in the Washington-Arlington-Alexandria metropolitan statistical area. The classification rules placed Alexandria city in the large fringe metro category. The discriminant analysis indicated it should be classified as large central metro. Alexandria city has very high densities; compared with the other fringe counties it is the most densely settled or next most densely settled county (a rank of 1 or 2 for the density measures). Further, compared with the 59 central counties and the ten potentially misclassified counties it has a rank of 1 for percentage of land area in urban blockgroups, ranks of ten or 11 for the other density measures. It also has one of the lowest levels of percentage owner-occupied housing units, compared with both other central counties and other fringe counties. On the other hand, it is more similar to the fringe counties with respect to percentage commuting, median household income, percentage of households below the median income, and population size (because it is only the city). Alexandria city is more racially and ethnically diverse than most fringe counties. Because of the high density measures, the decision was made to classify this city as central in accordance with the discriminant model.

2. **DeKalb County, GA** (FIPS=13089). Final classification: **fringe**. DeKalb County, GA is one of 28 counties in the Atlanta-Sandy Springs-Marietta, GA metropolitan statistical area. It was classified as fringe by the classification rules, but as central by the discriminant model. DeKalb has no large cities and while a fairly large percentage of its land area is contained in urban blockgroups, the housing density within the urban blockgroups and the overall housing density within the county are low compared to central counties. DeKalb was more similar to fringe than central counties with regard to commuting, the jobs to workers ratio, and household income. DeKalb is more racially and ethnically diverse than many central counties, primarily because of its large black population. Because DeKalb has no large cities and moderate density measures, it seemed preferable to classify DeKalb County as fringe in accordance with the classification rules.

3. **Hudson County, NJ** (FIPS=34017). Final classification: **central**. Hudson is one of the 23 counties in the New York-Northern New Jersey-Long Island, NY-NJ metropolitan statistical area. The classification rules placed Hudson County in the fringe category because the population of the principal city within its boundaries (Jersey City) is less than 250,000. The discriminant model classified Hudson County as central metro. Hudson has very high population and housing densities (higher than all other fringe counties); indeed it is more densely settled than most central counties. Hudson also has a higher proportion of crowded housing than most fringe counties, a lower percentage of owner-occupied housing than any other fringe county, and a higher percentage of its population with low income than most fringe counties. Hudson is more racially and ethnically diverse than most fringe counties. Because of its extremely high densities, crowded housing, low percentage of owner-occupied housing, and higher percentage of households with incomes below the median, this county is classified as central metro in the 2006 NCHS Urban-Rural Classification scheme in accordance with the discriminant model.

4. **Norfolk city, VA** (FIPS=51710). Final classification: **central**. Norfolk city, an independent city treated as a county equivalent, is one of the 16 counties/independent cities in the Virginia Beach-Norfolk-Newport News, VA-NC metropolitan statistical area. This is a loosely organized area with several major port cities, all of which are independent cities. The classification rules placed this city in the fringe metro category because it is not the largest principal city in the metro area and its population is less than 250,000 (Norfolk has a smaller population than most central counties because it is just a city). The discriminant analysis indicated that Norfolk should be classified as central. Examination of the various settlement density, economic, and social variables shows that Norfolk is more similar to the most urban central counties than it is to fringe counties. Norfolk has higher densities than most fringe counties (population density, housing density, percentage of county in urban blockgroups, housing density of urban blockgroups). Indeed, its density measures are so high that they are in the top quartile of central county measures. Norfolk's values on a number of other measures are similar to those of the more urban central counties and dissimilar from those of most fringe counties: low commuting rate, low percentage of owner-occupied housing, low median income, high jobs to workers ratio, and high percentage of households with incomes below the median and families under the poverty level. Accordingly, Norfolk city is classified as large central metro in the 2006 NCHS Urban-Rural Classification in accordance with the discriminant model.

5. **Pierce County, WA** (FIPS=53053). Final classification: **fringe**. Pierce County is in the three-county Seattle-Tacoma-Bellevue, WA metropolitan statistical area. The classification rules placed Pierce County in the fringe metro category because it does not contain any of the population of the largest principal city and the population of the principal city in its boundaries is less than 250,000. The discriminant analysis indicated Pierce should be classified as central. Pierce is not densely settled; its densities are more similar to those of the less urbanized fringe counties than they are to those of central counties. Only 7% of the county area is in urban blockgroups, the density within these areas is only moderate, and housing density is very low. Pierce's values on a number of other measures are similar to those of fringe counties and dissimilar from those of most central counties: low jobs to workers ratio and low percentage of families under the poverty level. On the other hand, Pierce's low commuting rate, high percentage of single family households, and very high percentage reporting multiple-race resemble those measures in the central counties, and may explain why the

discriminant model classified it as central. Because it is not densely settled, Pierce County is classified as large fringe metro in the 2006 NCHS Urban-Rural Classification, in accordance with the classification rules.

6. **Pinellas County, FL** (FIPS=12103). Final classification: **central.** Pinellas County is in the four-county Tampa-St. Petersburg-Clearwater, FL metropolitan statistical area. Pinellas County, FL, which was placed in the large central category by the discriminant model, missed being placed there by the classification rules because the population of St. Petersburg, the principal city, is just under 250,000 persons. For the 2006 NCHS Urban-Rural Classification, Pinellas County was placed in the large central category because a number of its characteristics were more similar to those of the large central counties than to those of the large fringe counties: a large percentage of its land area is in urban blockgroups, high population and housing densities, high percentage of households with incomes below the median, low median income, and low commuting rates

7. **Portsmouth city, VA** (FIPS=51740). Final classification: **fringe**. Portsmouth city, an independent city treated as a county equivalent, is one of the 16 counties/independent cities in the Virginia Beach-Norfolk-News, VA-NC metropolitan statistical area. Portsmouth is one of the major ports of this loosely organized metropolitan area, and hence one of its economic centers. The classification rules placed this city in the large fringe metro category because it is not the largest principal city in the metro area and its population is less than 100,000 (well under the 250,000 cut point). The discriminant analysis indicated Portsmouth should be classified as central. This may be because most of Portsmouth city is in urban blockgroups (72%). Portsmouth city has a relatively high housing density, which is more in line with that of the central counties than that of the fringe counties. In addition, Portsmouth has a relatively low median income and relatively high poverty rates. Again, both of these measures are more in line with those of central counties than with those of fringe counties. Despite some of its “central county” characteristics, Portsmouth city’s small population made it seem desirable to classify it as large fringe metro in the 2006 NCHS Urban-Rural Classification, in accordance with the classification rules.

8. **Providence County, RI** (FIPS=44007). Final classification: **central**. This county is one of six counties in the Providence-New Bedford-Fall River RI-MA metropolitan statistical area. The classification rules placed Providence in the large central metro category because it contains all of the population of Providence, the largest principal city in the metropolitan area. The discriminant analysis indicated that it should be classified as fringe, probably because it has only moderate population and housing density compared to the other central counties. Despite the discriminant analysis results, Providence is classified as large central metro in the 2006 NCHS Urban-Rural Classification scheme, in accordance with the classification rules, because it contains all of the largest principal city in the metropolitan area and because no other county in the metropolitan area was categorized as central by either approach. It seemed desirable to have at least one central county in each large metro area.

9. **San Bernadino County, CA** (FIPS=06071). Final classification: **fringe**. This county is one of the two counties in the Riverside-San Bernadino, CA metropolitan statistical area. The classification rules placed this county in the large fringe metro category because it does not contain the largest principal city in the metropolitan statistical area and the population of each of the principal cities in this county is less than 250,000. The

discriminant model indicated that San Bernadino county should be classified as large central metro. Although San Bernadino has a population of almost 2 million and numerous cities with populations between 100,000 and 200,000, it is relatively sparsely settled because of its large land area (percentage of county area in urban blockgroups is low at 1.3). San Bernadino has very low population and housing densities, lower than many of the fringe counties and much lower than those of central counties (because of its large land area). Because of its sparse settlement pattern, the decision was made to classify San Bernadino County as large fringe metro in the 2006 NCHS Urban-Rural Classification, in accordance with the classification rules.

10. **Virginia Beach city, VA** (FIPS=51810). Final classification: **central**. Virginia Beach city, an independent city treated as a county equivalent, is one of the 16 counties in the Virginia Beach-Norfolk-Newport News, VA-NC metropolitan statistical area. This area is a loosely organized metropolitan statistical area with several major ports. The classification rules place Virginia Beach city in the large central metro category because it contains all of the population of Virginia Beach city, the largest principal city in the metropolitan statistical area. The discriminant analysis indicated that it should be classified as large fringe metro, probably because some of its characteristics are more similar to those of fringe counties than those of central counties: small population (because it is just the city), low housing density, high percentage commuting, high median household income, and low racial/ethnic diversity compared to the other central counties. Despite the discriminant analysis results, Virginia Beach city is classified as large central metro in the 2006 NCHS Urban-Rural Classification, because it is the largest principal city in the metropolitan area.

Table A. Values and ranks of settlement density variables for the ten potentially misclassified counties

	County population			Population density			Housing density			Percentage of area in urban blockgroups			Housing density in urban blockgroups			Percentage households in crowded conditions		
County name	N	R1	R2	Density	R1	R2	Density	R1	R2	%	R1	R2	Density	R1	R2	%	R1	R2
Alexandria city, VA	128,206	66	151	8,452	10	2	4,233	11	2	100	1	1	4,233	10	2	8	23	12
DeKalb, GA	675,725	48	26	2,483	28	19	1,371	65	111	64	19	12	974	28	19	7	29	24
Hudson, NF	606,240	55	35	13,044	6	1	9,753	4	1	52	25	19	5,154	6	1	11	15	5
Norfolk city, VA	237,835	64	91	4,363	16	7	2,362	27	13	72	12	10	1,757	16	6	6	35	43
Pierce, WA	745,411	43	21	417	63	113	1,573	58	65	7	63	100	165	63	112	5	40	62
Pinellas, FL	928,537	32	13	3,292	22	12	2,064	34	20	80	5	6	1,720	17	7	3	60	155
Portsmouth city, VA	99,291	67	172	3,033	25	13	1,711	51	42	71	14	11	1,255	24	12	4	51	89
Providence, RI	641,883	53	30	1,504	42	41	2,509	22	6	21	48	56	613	42	39	47	52	100
San Bernardino, CA	1,921,131	12	1	85	67	259	1,645	52	49	1	67	186	30	67	267	14	7	2
Virginia Beach city, VA	440,098	62	57	1,713	38	32	1,781	47	35	33	35	32	654	41	34	3	57	141

Note: R1 is the rank of the county among the 57 large central counties and the ten potentially misclassified counties.
R2 is the rank of the county among the 350 large fringe counties plus the ten potentially misclassified counties.

Table B. Values and ranks of selected economic variables for the ten potentially misclassified counties

	Percentage commuting outside county to work			Jobs to workers ratio			Percentage owner-occupied housing units			Median household income			Percentage below median household income			Percentage single parent households			Percentage of families under poverty		
County name	%	R1	R2	Ratio	R1	R2	%	R1	R2	$	R1	R2	%	R1	R2	%	R1	R2	%	R1	R2
Alexandria city, VA	75	67	345	1.1	46	28	40	7	3	57,620	66	266	36	50	229	6	66	282	7	56	110
DeKalb, GA	56	64	194	0.9	58	59	58	29	14	47,744	52	184	40	39	190	12	14	17	8	44	83
Hudson, NJ	54	61	176	0.9	59	75	31	4	1	38,907	15	79	59	8	32	11	19	25	13	14	16
Norfolk city, VA	33	50	17	1.7	7	6	46	10	6	30,863	7	10	54	15	67	14	5	6	16	10	6
Pierce, WA	30	47	11	0.8	62	100	63	46	29	46,222	48	168	45	30	137	11	19	25	7	56	110
Pinellas, FL	14	29	3	1.0	56	41	71	67	77	37,179	14	53	54	15	67	7	63	208	7	56	110
Portsmouth city, VA	55	62	186	1.1	34	18	59	33	15	33,611	10	27	50	22	98	14	5	6	13	14	16
Providence, RI	27	44	6	1.0	52	36	53	20	10	36,493	11	47	55	12	61	11	19	25	12	21	24
San Bernardino, CA	31	48	12	0.9	60	83	64	52	32	40,950	25	99	43	36	154	13	11	12	13	14	16
Virginia Beach city, VA	43	58	86	0.8	63	143	66	59	39	49,481	58	202	31	59	275	10	36	37	5	64	191

Note: R1 is the rank of the county among the 57 large central counties and the ten potentially misclassified counties.
R2 is the rank of the county among the 350 large fringe counties plus the ten potentially misclassified counties.

Table C. Values and ranks of selected demographic variables for ten potentially misclassified counties

	Population distribution														Isolation Index, whites		
	White			Black			Asian			Hispanic			Multiple-race					
County name	%	R1	R2	%	R1	R2	%	R1	R2	%	R1	R2	%	R1	R2	Index	R1	R2
Alexandria city, VA	55	33	29	23	26	43	6	17	23	15	27	33	1.7	22	37	0.62	17	24
DeKalb, GA	33	6	4	55	5	5	4	27	36	8	37	74	1.1	47	95	0.60	13	22
Hudson, NJ	37	11	7	13	41	86	10	9	10	40	5	4	1.5	26	48	0.52	3	9
Norfolk city, VA	48	26	14	45	9	13	3	34	54	4	49	118	1.9	15	26	0.63	18	27
Pierce, WA	78	60	112	8	55	139	7	14	17	6	41	89	4.2	1	1	0.79	48	101
Pinellas, FL	84	66	152	9	50	123	2	49	85	5	44	98	1.0	54	127	0.86	64	166
Portsmouth city, VA	46	20	10	51	7	9	1	65	131	2	60	181	1.4	29	56	0.70	29	56
Providence, RI	76	57	99	7	58	151	3	34	54	13	30	40	1.5	26	48	0.82	56	127
San Bernardino, CA	46	20	10	9	50	123	5	21	28	39	6	6	2.2	11	14	0.53	4	14
Virginia Beach city, VA	71	51	76	19	31	56	6	17	23	4	49	118	2.2	11	14	0.73	38	62

Note: R1 is the rank of the county among the 57 large central counties and the ten potentially misclassified counties.
R2 is the rank of the county among the 350 large fringe counties plus the ten potentially misclassified counties.

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